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Potential Metal Economy

The foundry technician has at his disposal a wealth of literature dealing with the metallurgy of cast metals. The practical man, too, has available much descriptive matter on the actual manufacture of castings. However, there is still a body of foundrymen who lack technical information to be used for co-operation with customers. This was stressed in a Paper on the "Requirements of Machine-shop Inspection,"* by Mr. C. Walker and Mr. F. H. Greenwood. During the discussion, Mr. Hill related an experiment he had made on the influence of pouring speed on the weight of the resulting casting. Using two identical moulds for the making of an 80-lb. casting, he found that one poured in 13 secs. was 4 to 5 lb. heavier than one poured in 17 secs. This is a very important statement and indicates that further work might be done on the influence of casting temperature, ramming density and other factors on the ultimate weight. Obviously if a foundry is selling by weight, then there is a possibility of 6 per cent. increase in turnover or if by piece a reduction of a similar amount. Mr. Hill was referring to grey cast iron—a relatively cheap metal—yet the difference of 4 secs. in pouring time (just one factor) shows a potential saving of 225,000 tons on last year's total output figures. Obviously, this is an exaggeration as no doubt some concerns will have fortuitously obtained the optimum.

The significance of the subject receives added importance when related to the non-ferrous foundry industry, where raw materials of much greater value are incorporated. Of course, it may be that neither pouring speeds nor casting temperature may have a profound effect on the weight of the as-cast product, but, so far as we remember, no data on the subject have been published, except perhaps some early work on the casting of cubes. At that time the research worker doubtlessly would have been dealing with density, which is in much the same category from the point of view of these remarks.

We are conscious that the substance of the above argues from the particular to the general, but the disclosure by Mr. Hill of such a saving does reveal the need for more information on the influence of various factors on the weight of castings. Moreover, research would not have to end there, for the lighter-weight castings may not be such as sound a job as the heavier ones. The steel people have done a great amount of research on teeming speeds and, nowadays, it is normal practice to control the time of pouring of each type of ingot. Castings, being more complicated, need the accumulation of a vast quantity of data before much light would be thrown on the subject—yet obviously such studies may result in worthwhile economies.

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* Printed in the JOURNAL, April 24; see also page 467 of this issue.

International Foundry Delegation

(*From our Special Correspondent*)

Members of the European party visiting America for the International Foundry Congress and Exhibition included, among those from the Institute of British Foundrymen, Mr. John Bell, vice-president-designate, and Mr. T. Makemson, secretary. Two days after leaving, a briefing meeting was held on board the "Britannic" of all the members of the party (representing six nationalities) at which the secretary explained the organization of the Congress and the arrangements which were being made to enable those attending to obtain the maximum amount of technical benefit. Mr. J. J. Sheehan was in the chair at this meeting. New York was reached on the afternoon of April 18 after a very pleasant and memorable voyage, for which the friendly and hospitable attentions of the officers and crew of the "Britannic" were largely responsible.

Among those who greeted the party at Pier 92 at New York, were Mr. W. Maloney, secretary of the American Foundrymen's Society, Mr. Frank Steinbach, Editor-in-chief of our contemporary *Foundry*, and Mr. John Bolton, of the British Steel Founders' Association, who has been loaned by the Association to fill the post of secretary of the O.E.E.C. Technical Assistance Group, which includes a substantial majority of the Europeans present at the Congress.

Programmes

The Technical Assistance Group or M.S.A. team were accommodated in New York at the Hotel Park Sheraton, where several technical and organizational meetings were held. Those members of the party not travelling under M.S.A. auspices were accommodated at the Statler Hotel. The tours of industrial United States commenced on Sunday night, April 20, when two groups left the Grand Central Station by night expresses. The "blue" tour consists entirely of M.S.A. participants and will travel via Buffalo, Detroit and Chicago, and then proceed to Atlantic City. The "red" tour proceeds via Cleveland, Chicago and Cincinnati to Atlantic City. These notes are being written by our representative on the "red" tour, which includes not only M.S.A. participants but others of various nationalities, including several British who are taking part or all of the tour under arrangements with Thomas Cook & Sons' New York office.

Cleveland, Ohio, one of the greatest foundry centres in the world, was reached at 7.30 a.m. on Monday, April 21. After transfer to the hotel, members were taken in motor-coaches to foundries of their choice, and a similar programme was carried out in the afternoon. At 5.0 p.m., all the visitors were the guests of the N.E. Ohio Chapter of the American Foundrymen's Society at a reception at the Cleveland Athletic Club. Many American foundrymen well-known to their European colleagues were present among the hosts, including Mr. Seelbach, president of the A.F.S., and Mr. Woody, the immediate past-president. Another intensive programme of works visits is being carried out to-day and to-morrow, April 22 and 23, and at midnight on April 23 the "red" tour leaves for Chicago.

The weather is fine and warm, in fact the weather in New York would in Britain be regarded as a mild heat wave.

BRICK PRODUCTION in the first quarter of this year increased by 13 per cent. compared with the same period of 1951 and has met the needs of the building programme, it was stated by the Minister of Works in Parliament recently.

British Industries Fair

At the British Industries Fair, Engineering and Hardware Section, which opens at Castle Bromwich, near Birmingham, on Monday next, May 5, a number of foundry-equipment manufacturers and suppliers of foundry materials are exhibiting. For the convenience of readers who are planning visits to the Fair, a list of these firms and their stand numbers is printed below.

Canning, W., & Company, Limited, Birmingham, D, 207/108 and D, 211.
Colin Stewart, Limited, Winsford, Cheshire, B, 601.
Colin Stone Company, Limited, London, B, 601.
Crone & Taylor, Limited, St. Helens, Outdoor, 1,304.
Flexible Drive & Tool Company, Limited, London, D, 150.
Flexible Drives (Gilmans), Limited, Smethwick, D, 506 and Outdoor, 1,345/1,244.
Flextol Engineering Company, Limited, London, D, 231.
Foundry Equipment, Limited, Leighton Buzzard, Beds., D, 427/326.
Fullers' Earth Union, Limited, Rechill, Surrey, D, 117.
Incandescent Heat Company, Limited, Smethwick, C, 727/628, and B, 309/208.
Kleen-e-ze Brush Company, Limited, Bristol, D, 143.
Lees Hall & Sons, Limited, Newhaven, Sussex, D, 112.
Lister, R. A., & Company, Limited, Dursley, D, 205.
Morgan Crucible Company, Limited, London, D, 305/204.
Morris, B. O., Limited, Coventry D, 423.
Pioneer Mixers, Limited, Monkseaton, Northumberland, Outdoor, 1,327/1,226.
Purimachos, Limited, Bristol, D, 161.
Rapid Magnetic Machines, Limited, Birmingham, C, 421.
Reed Crane & Hoist Company, Limited, Bristol, D, 702.
Sternol, Limited, London, D, 751.
Suffolk Iron Foundry (1920), Limited, Stowmarket, Suffolk, D, 620.
Wright, Ernest N., Limited, Wolverhampton, Outdoor, 1,339/1,238.

The Fair will be open from 9.30 a.m. to 6 p.m. each day, with the exception of Sunday, May 11, until May 16 when the Fair closes at 4 p.m.

Osborn Centenary

A banquet held last Friday evening at the Royal Victoria Hotel, Sheffield, was the concluding event of celebrations lasting the whole week. No fewer than 5,000 people have been entertained by Samuel Osborn & Company, Limited, at a series of six social functions.

Mr. Frank A. Hurst, the chairman of the company, presided, and at an early stage announced that the speeches were being relaid to Sir Samuel Osborn's home, who at the age of 87, no longer accepts evening engagements. The toast of the company was given by the Lord Bishop of Oxford, whose father was for many years secretary of the company. The toast was supported by the Rev. George M. Osborn—a nephew of Sir William.

Replying, Mr. Hurst announced that he had received a telegram of good wishes from Her Majesty the Queen. To mark the occasion, Sir William had presented a block of shares for the benefit of the employees.

A box which was sealed 50 years ago was opened by Mr. W. R. Snow the managing director of the South African concern, and contained many interesting souvenirs of the time. A second similar box was made up and sealed. It is to be opened in the year 2002. There were about 350 guests present, who were in the main associated with the firm, and the atmosphere was that of a family party.

Reducing Canteen Pilfering.—One of our friends, who has now left the foundry to manage a works in an allied industry, tells us that he has virtually eliminated the pilfering of canteen cutlery by the following system. The canteen staff are made entirely responsible for the equipment. When replacements become necessary, they buy new stocks and the cost is added to meals served until liquidated. A mere explanation of the system to the staff resulted in practically eliminating these deplorable petty thefts.

Ways and Means to Increased Productivity*

By John Hunter

After giving the general factors affecting productivity in the foundry industry, the Author lists and examines in detail the major influences and means for improvement. In turn, patterns; moulding boxes; manual effort; roller-track; overhead hoppers; Sandslingers and rubbish disposal are dealt with in this way. The inter-relation of plant utilization is particularly emphasized.

In the past few years the need to increase productivity in industry has become vital to this country more than ever before. Much has ben accomplished already in speeding up production, and many new developments are taking place which will help to keep us to the forefront as an industrial nation, but other countries are equally alive to the same problem, and foundrymen must not relax their efforts to become as efficient as possible.

When efficiency comparisons are made with other industries, foundries are at a considerable disadvantage, since they have to contend with many variables, such as quality of sand, variations in pig-iron, scrap and coke; loam, dry- and green-sand work, which require different methods of production; balance of melting and metal control; the use of equipment which has to cater for a large range of work, and many other factors. These features are probably the main reasons why the industry as a whole is considered to be lagging behind others in overall efficiency. There are, of course, other factors which have to be taken into consideration, such as shortages of raw materials and skilled labour, which bring additional difficulties when endeavours are made to step up production to a more economic level.

Another drawback to productivity assessment is the variation in methods of manufacture, which are to be found even in foundries producing similar work. Other features such as weight of metal per mould, pattern-plate layout, quality of finish required, dry- or green-sand moulding, methods of coring, etc., can all qualify the production figures per operative per annum, and such figures must therefore be used with great care when making comparisons. The industry has obtained some very useful information relating to foundry practice from the excellent reports published by the teams which recently visited America, and many foundrymen are endeavouring to make as much use of possible of the details given, but others, while anxious and willing to do so, find it difficult to apply the information to their own particular problems. In many instances, this difficulty is due to the absence of a long-term policy of planning, and a tendency to assess the increase in efficiency to be obtained from one piece of equipment without relating it to ancillary machinery and to the full development of the particular foundry.

Long-term Policy

Every foundry should have a long-term policy of planning clearly set out so that all executives have a true appreciation of the company's requirements, which will enable them to build-up equipment gradually and re-organize to meet the over-all plan. To determine such a policy, it is necessary to set down the prinicipal factors which are at present restricting production, with a view to assessing them in their true light, and also relating one to another. When once this has been done, the re-planning of the foundry should be arranged in such a manner that the purchase of equipment can be spread over a predetermined period, depending on the capital available for expansion.

With a reasonable degree of certainty it can be said that by far the greater proportion of foundries are affected by:—

1. Shortage of skilled moulders;
2. Variable nature of the work to be produced;
3. Low rate of output in relation to the melting equipment in use; and
4. General restrictions of site conditions.

These can be classified as the principal limitations affecting production, but many others could be added, such as the work being of a non-repetitive nature, qualities of finish required, different compositions of metal necessary, and so on.

Shortage of Skilled Moulders

The shortage of skilled moulders, together with the lack of apprentices, is probably the most serious problem the foundryman has to face to-day, and prospects for the supply of skilled labour for the future are by no means bright. While much can be done to attract youths into an industry which is full of interest, and has great possibilities for ingenuity, it is obvious that in the future far fewer skilled men will be available at floor level. It is imperative, therefore, for the skill of the worker to be used to its greatest advantage by breaking down the work in such a manner that the operator need not waste valuable time in sand preparation, patching of moulds, or waiting for the crane.

Incentive schemes are of major importance in stepping-up production, and can help to some extent in overcoming the shortage of skilled labour. The subject is a complex one, and cannot be discussed in detail in the short time available, but existing schemes should be examined with a view to improvement. The benefits to be obtained from an equitable scheme cannot be overstressed, and usually lead to a better spirit of co-operation between the management and operatives.

* Paper read before the Scottish branch of the Institute of British Foundrymen. The Author is leader of the Operational Research Team, British Cast Iron Research Association.

TABLE I.—*Manual Effort in Moulding with Boxes. Example I, Hand Moulding on Floor.*

Assumptions—
Floor area : 130 by 40 ft.
Equipment : Double-sided pattern-plate (30 lb.), half boxes 16 by 12 by 3½ in. (20 lb.), 40-lb. capacity handshank, facing-sand mill, and portable aerator.
Aim.—To produce 4 moulds with 7 lb. of castings in each box.
Manual Work—

	Lb.	Ft.	Ft.-lb. lift.
Metal to pouring zone (by hand), shank weighing 40 lb.	80	40	160
Return shank to furnace (by hand)	40	40	—
New sand to mill (by barrow)	20	15	60
Old sand to mill (by barrow)	60	30	180
Facing sand from mill to floor (by barrow)	80	70	80
Backing sand from floor to aerator (by shovel)	260	78	520
Place pattern and box on floor (by hand)	280	48	280
Fill boxes with sand	340	96	340
Hand ram (5 lb. weight—40 rams at 6 in.)	5	24	800
Turnover mould and pattern	450	—	450
Pattern draw	370	16	370
Close box	250	8	250
Weights on and off (45 lb. each)	360	24	360
Knock-out	540	24	540
Castings to fettling shop (by barrow)	28	40	84
Runners and risers to stockyard (by barrow)	12	20	36
	3,175	573	4,510

Ratio of materials handled to weight of castings produced = 113.4 : 1
Distance moved by operators to produce 1 ton of castings = 8.64 miles
Vertical lift effort to produce 1 ton of castings = 161 ft.-tons

TABLE II.—*Manual Effort in Moulding with Boxes. Example II, With Moulding Machines.*

Assumptions—
Floor area : 130 by 40 ft.
Equipment : Power moulding machine, half boxes 16 by 12 by 3½ in. (20 lb.), 40-lb. capacity handshank, facing-sand mill, and portable aerator.
Aim.—To produce 4 moulds with 7 lb. castings in each box.
Manual Work.—

—	Lb.	Ft.	Ft.-lb. lift.
Metal to pouring zone (by hand), shank weighing 40 lb.	80	40	160
Return shank to furnace (by hand)	40	40	—
New sand to mill (by barrow)	20	15	60
Old sand to mill (by barrow)	60	30	180
Facing sand from mill to floor (by barrow)	80	70	80
Backing sand from floor to aerator (by barrow)	260	30	520
Backing sand through aerator (by shovel)	260	—	260
Place box on machine (by hand)	160	48	480
Fill box with sand (by shovel)	340	96	1,020
Carry mould to floor	500	320	500
Weights on and off (45 lb. each)	360	24	360
Knock-out	540	24	540
Castings to fettling shop (by barrow)	28	40	84
Runners and risers to stockyard (by barrow)	12	20	36
	2,740	797	4,280

Ratio of materials handled to weight of castings produced = 98 : 1
Distance moved by operators to produce 1 ton of castings = 12.1 miles
Vertical lift effort to produce 1 ton of castings = 153 ft.-tons

Patterns

Pattern equipment should be one of the first items to be considered, when once a long-term policy has been established. This item invariably calls for some hard thinking, because of the heavy expenditure which may be involved. It should be borne in mind, however, that very large savings can be made in finishing time if the moulder is given first-class equipment with which to work. The majority of foundries producing work of a repetitive nature have of course developed metal patterns, but the heavy initial cost sometimes prevents this type of equipment being used in the semi-jobbing foundries. It is a matter, however, which should be given careful thought, especially if the work is likely to repeat itself over a period. Hardwood patterns mounted on plates are a good substitute, and can have a reasonably long life if properly maintained. They are especially useful for short runs on moulding machines, but care has to be taken to keep the varnished surfaces intact in order to prevent moisture penetration.

The various methods of pattern-mounting and other variations in the same theme are well known, and are practised in many foundries, but it is surprising the number of jobbing foundries which persevere in the use of loose patterns, even when it is known that repeat orders will be coming along for the same castings. The majority of such patterns, when split, can be dowelled and mounted on standard boards or plates, which have been drilled to standard spacing. This type of mounting is extremely useful when a Sandslinger is used, and can be successfully adapted for fixing patterns on the larger types of moulding machines. Another important aspect of this type of mounting is the reduction of finishing time when floor moulding, and the possibilities of introducing semi-skilled and apprentice labour for more intricate work.

TABLE III.—*Manual Effort in Moulding with Boxes. Example III, With Full Mechanization.*

Assumptions—
Floor area : 130 by 40 ft.
Equipment : Power moulding machines, complete sand recondition ing plant with powered mould conveyor, half boxes 16 by 12 by 3½ in. (20 lb.), 120-lb. capacity shank on monorail.
Aim—To produce 4 moulds with 7 lb. castings in each box.
Manual Work—

—	Lb.	Ft.	Ft.-lb. lift.
Metal to pouring zone by suspended shank weight 80 lb.	67	24	67
New sand to mill (by barrow)	20	15	60
Empty box from roller-track to machine (by hand)	160	48	160
Spilled sand from floor to machine (20 per cent.) (by shovel)	68	18	204
Mould from machine to conveyor	500	48	500
Weights on and off (45 lb. each)	360	24	360
Empty boxes from knock-out to roller track	160	24	320
Castings to fettling shop (by barrow)	28	15	56
Runners and risers to stockyard (by barrow)	12	20	24
	1,375	236	1,751

Ratio of materials handled to weight of castings produced = 49.1 : 1
Distance moved by operators to produce 1 ton of castings = 3.57 miles
Vertical lift effort to produce 1 ton of castings = 63 ft.-tons

Moulding Boxes

Coupled with the development of pattern equipment is the determination of box sizes to be used. It is obvious that the fewer box sizes required, the simpler becomes the question of handling and storage. The use of a Sandslinger or moulding machine helps considerably in standardization, since the use of the nearest larger standard box with this type of equipment makes very little difference to the time taken to make the mould.

It is normally recognized that a moulder can handle 18-in. by 14-in., or 20-in. by 12-in. boxes, without undue fatigue, but it is surprising the number of foundries which are still using boxes as small as 14 in. by 12 in. or 12 in.

by 10-in. Not only can output be increased by the use of the larger sizes, but the yield of castings from metal melted is also increased, which, of course, is an important aspect with present-day raw material shortages. Respacing of the individual patterns on boards or plates should also be studied carefully after standard box sizes have been determined, with a view to increasing the yield still further. The weight of the box parts should also be investigated, and for green-sand work, steel or aluminium-alloy boxes should replace the heavier cast-iron types, when the parts have to be lifted by hand. Box-pin holes should be fitted with round and slotted bushes, in order to avoid binding when the boxes become slightly distorted, and to reduce the risks of cross-jointing when the box-pin holes become enlarged.

Maintenance should be carried-out regularly and systematically, since only by having first-class box-parts can good moulds be produced. A simple method of arranging systematic checking is to divide the total number of boxes in use into five or more equal parts, and arrange for daily inspection in sequence according to the number on the box.

Level of Production

Over 80 per cent. of the foundries in this country are of the jobbing, or semi-jobbing type, and have to contend with a range of castings weighing a few ounces up to perhaps two or three tons or more. A considerable proportion of these foundries are producing at the rate of 400 to 700 tons of castings per annum, and for one reason or another can only arrange to cast every other day. This invariably leads to congestion on the foundry floor, as well as the need for additional labour in handling extra box-parts and larger quantities of sand. Very often these conditions arise from considerations of the melting equipment available, which may be one or two large cupolas, capable of melting 4 to 5 tons per hr., so as to cater for the largest casting likely to be produced. In many instances, where the metal melted is in the region of 1,000 tons per annum, it would be possible to cast every day by replacing one of the larger cupolas with a smaller unit, having a melting rate of 1½ to 2 tons per hr., and using it every second day in conjunction with the remaining large cupola. It would, of course, be necessary to segregate the work to some extent, but congestion on the floor would be eliminated, handling costs would be reduced, and fewer box-parts would be required.

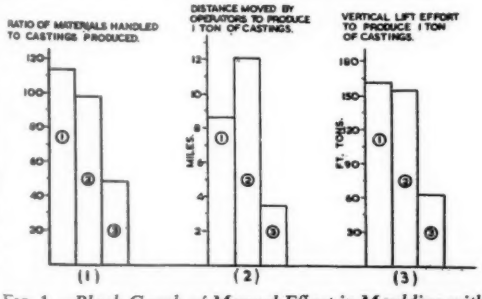
RATIO OF MATERIALS HANDLED TO CASTINGS PRODUCED.
DISTANCE MOVED BY OPERATORS TO PRODUCE 1 TON OF CASTINGS.
VERTICAL LIFT EFFORT TO PRODUCE 1 TON OF CASTINGS.
MILES.
FT. TONS.
(1)
(2)
(3)

FIG. 1.—*Block Graph of Manual Effort in Moulding with Boxes, Floor Area* 130 *by* 40 *ft. Example* (1) *Hand Moulding on Floor; Example* (2) *with Moulding Machines;* (3) *with full Mechanization.*

Floor congestion often leads to loss of efficiency, and with present-day building costs and the difficulties in obtaining licences for expansion, "good housekeeping" should be a predominant feature in British foundries. An actual example can be mentioned of a foundry being thoroughly spring-cleaned one Saturday morning, resulting in an increased production of over 5 per cent. during the ensuing weeks, simply because the men had more room in which to work. Many foundrymen who pay close attention to "good housekeeping" and other expedients still suffer from lack of sufficient floor area, and other facilities, such as the introduction of moulding machines and equipment are being used more and more to offset this limitation.

It is well known that the use of mechanized equipment can double or even treble output from the same floor area as compared with hand

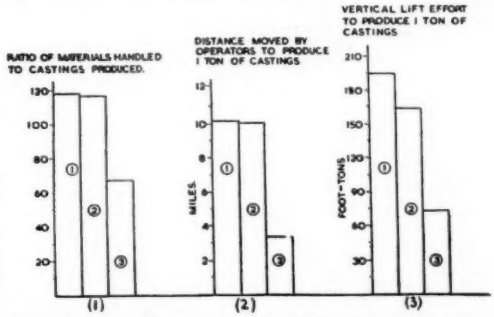

FIG. 2.—*Manual Effort in Moulding with Snap Flasks, Floor Area* 130 *by* 40 *ft. Example* (1) *Hand Moulding on Benches; Example* (2) *with Moulding Machines; Example* (3) *with full Mechanization.*

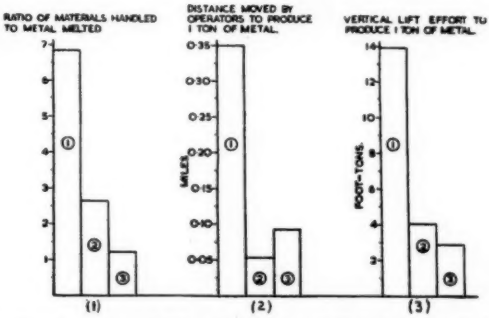

FIG. 3.—*Manual Effort in Stockyard* 70 *ft. long by* 40 *ft. wide. Example* (1) *Equipment:—Lift Hoist and Weighing Machine on Platform. Example* (2) *Equipment:—Overhead Crane with Electro-magnet, local Stock Bins and Weighing Machine on Charging Platform. Example* (3) *Equipment:—Overhead Crane with Electro-magnet, and Skip Hoist at Ground Level with Weighing Platform Underneath.*

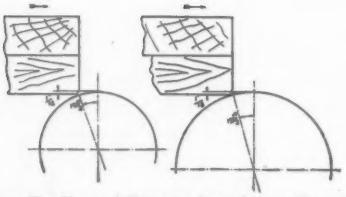

FIG. 4.—*Fouling of Bottom-boards on 2¼ and 3 in. dia. Rollers.*

moulding methods, but it is not fully understood that when moulding machines are introduced without ancillary equipment, the manual effort increases almost proportionately with the increase in output obtained, resulting in a restriction in production due to the fatigue of the operator. This is an important aspect and should be studied very carefully when moulding machines are being considered.

Manual Effort in Moulding with Boxes

Tables I to III show an approximation of the manual effort required for three different methods of moulding. In each case, a floor area of 130 ft. by 40 ft. has been assumed, and the figures in the tables relate to the production of four moulds, with 7 lb. of castings in each mould. Manual effort has been split up into three categories:—(1) Weight of materials and equipment which have to be carried or handled; (2) distance the operators have to move during the cycle of production and (3) vertical lift effort exerted in handling the materials and equipment.

Table 1 shows the manual effort to produce by hand methods on the floor, when using a double-sided pattern-plate weighing 30 lb., and 16 in. by 12 in. by 3½ in. boxes, each weighing 20 lb. Metal is carried in 40-lb. hand shanks, a facing-sand mill and portable aerator being used for sand preparation. Table II depicts the same area with a line of moulding machines introduced against the wall, and moulds laid out on the floor, the rest of the equipment being the same as in the previous example. The machines, mill and aerator can, however, be incorporated to form a simple mechanized unit, the overall dimensions of which would be suitable for a building 130 ft. long by 40 ft. wide. With the aid of a power-driven mould conveyor and other normal ancillary aids, the manual effort is reduced to the proportions as shown in Table III.

A comparison of the three methods is shown more readily by the use of a block graph (Fig. 1). It can be seen quite clearly that when moulding machines are used without mechanical aids for delivery of sand and for the handling of boxes and moulds, the effort which has to be expended by the operators is practically the same as when moulding on the floor, while the distance moved is increased by approximately 40 per cent.

Similar comparisons can be made with snap-flask moulding, and the results (Fig. 2) show a similar trend as with box moulding. The net effort, however, is on the whole slightly higher when compared with box moulding, since in this case the operator has to handle the pattern, and moulds are conveyed by stillages on roller-tracks instead of a power-driven plate conveyor. The additional effort in handling the pattern can be eliminated if the snap flasks are superseded by slip or "pop-off" flasks, used in conjunction with single-sided pattern-plates fixed to the moulding machines. The effort then compares favourably with the figures given for box moulding.

Estimating Labour Involved

This summing-up of labour involved is a simple and relatively rapid method of determining the production value of individual pieces or combinations of equipment, which can be readily applied to any department. A further example is given (Fig. 3) of the comparison of effort in a small stockyard. The first example is with the use of the conventional lift hoist, while the second and third examples show the saving in effort to be obtained by introducing overhead lifting equipment with an electro-magnet and the installation of a skip-hoist charger.

The main purpose of the foregoing figures on moulding is to obtain a reasonably accurate assumption of the maximum output which is likely to be

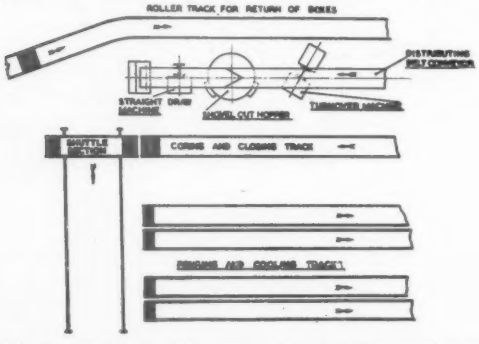

FIG. 5.—*Roller-track Layout, with a Shuttle section so as to permit Straight-line Operations.*

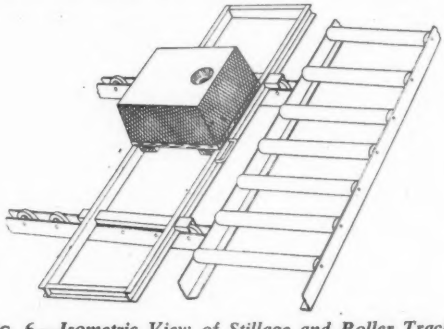

FIG. 6.—*Isometric View of Stillage and Roller Tracks. Stillages are made from 2 by 1 in. Channel. Weight 45 lb. Size 5 ft. 3 in. by 1 ft. 4 in. overall; runners 20 in. l.g.; to take 4 moulds 16 by 14 in. Double Roller Track: Cast-iron rollers 4 in. dia. by 1 in. face by 6 in. pitch; centres of tracks 30 in. Single Roller Track: Rollers 3 in. dia. by 20 in. long by 8 in. pitch.*

obtained from a given floor-area with a specific number of men, but at the same time they can also point the way to the best means of conserving labour, either directly or indirectly, by focusing attention on the interdependence of one piece of equipment on another.

Many jobbing foundries produce a percentage of castings in small runs, and with some degree of expansion this work could quite readily be made by mechanical means. The main drawback to this evolution is due to the melting equipment restricting pouring to the latter part of the day, which results in a comparatively large area being required for the storage of moulds. The first step should be an endeavour to extend the melting period, so as to make maximum use of the floor area available, and also to reduce the number of box-parts in circulation.

When once this has been done, the storing and pouring of moulds can be arranged on roller track, so that knocking-out and sand reclamation can take place at one point. Roller track, besides giving full use of the floor area, has the advantage of being comparatively inexpensive and flexible in application.

Roller Track

Objection to the use of roller track has been made by some foundrymen on the grounds that moulds are liable to damage before pouring. If the track is properly designed, the incidence of broken moulds should be no greater than with other methods of handling. It is, of course, important to purchase reliable equipment, with the runner angles straight, and the spindle holes accurately drilled in line. Fig. 4 illustrates the need for accurate drilling. Taking an example of a roller standing $\frac{1}{16}$ in. proud of the adjacent rollers, it will be seen that in the case of 2¼-in. dia. roller, the angle of fouling by the bottom-board is approximately 19½ deg., while for a 3-in. roller, it is 15½ deg. It is obvious that there is a greater risk of damage with the smaller roller, and it is advisable to use 3 in. dia. and upwards for mould handling, leaving the smaller rollers for such duties as box return, and the handling of comparatively light containers in the fettling shop.

Damage can be caused to unpoured moulds when they have to be pushed round roller-track curves, and wherever possible curves should be eliminated. When curves are used, not only is there a tendency to mould damage, but invariably extra room is required to lay out the roller tracks, resulting in an inefficient use of the floor area. The same remarks can also apply to coring and closing tracks placed at right angles to the pouring track. To overcome this problem, a shuttle section can be used, which allows the roller tracks to be laid out close together. Fig. 5 illustrates a shuttle-track layout, and shows clearly that full use of the floor area can be obtained. Another advantage is the handling of the moulds in straight lines, which tends to eliminate damage to the unpoured moulds.

The pitch of conveyor rollers is also important, and to obtain smoothness of running, it is necessary to have a minimum of three rollers under the bottom board at one time. For comparatively light work, such as 18- by 14-in. boxes, rollers should be at 4-in. pitch. Tracks can be level throughout if large-diameter rollers are used, since one man can readily move six to eight moulds of this size on a level track. The method shown in the illustration (Fig. 5) of arranging the roller tracks in straight lines also allows flexibility in pouring, and latitude in varying the cooling time for different classes of castings.

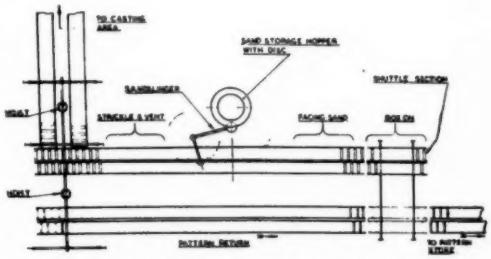

FIG. 7.—*Sandslinger Layout with Roller-track, incorporating Pattern Circulation.*

Overhead Hoppers

The majority of mechanized plants use overhead hoppers for feeding sand to the moulding machines, but where a very simple and inexpensive mechanized unit is required, shovel-out hoppers can be used to advantage. Overhead hoppers are usually limited to one-ton capacity in order to obtain reasonable flow, but shovel-out hoppers can conveniently have a capacity of five tons, and very often this additional capacity can simplify the rest of the plant by

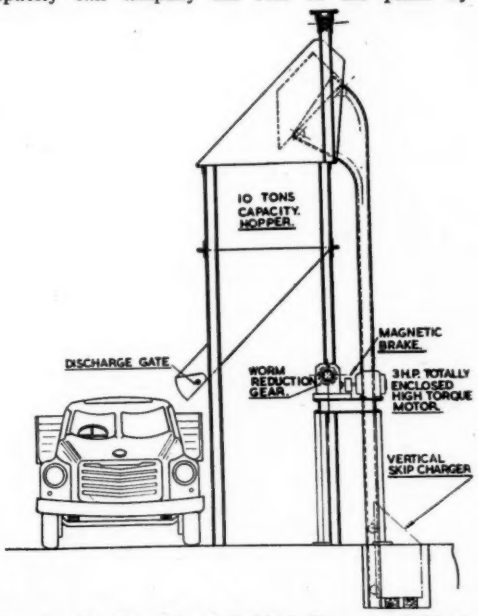

FIG. 8.—*Totally-enclosed Rubbish Hopper suitable for Foundries.*

reducing or even eliminating a main storage hopper. With the use of this type of hopper, it is unnecessary to have a man stationed overhead to operate the ploughs, since they can quite easily be controlled by the machine operators. It will, of course, be seen that the initial cost of the plant is reduced, since the distributing belt can be supported on the top of the hoppers, thus eliminating all additional structure and platforms.

A simple and inexpensive method of handling snap- or slip-flask moulds is shown in Fig. 6. This method is particularly useful in malleable iron or light castings foundries. The stillage shown is capable of carrying four moulds, and it is possible to arrange a considerable buffer storage area between the moulding machines and the pouring track in a relatively small area. The illustration does not show the correct method of transfer, but this can be simply arranged by extending the narrow roller-tracks between the pouring-track rollers and pivoting the extensions so that the stillage can be lowered approximately ¼ in. to rest on the pouring track.

Sandslinger Production

The Sandslinger is undoubtedly one of the most useful units for the development of mechanical means of moulding in jobbing foundries. In many instances, straightforward ramming on the floor is the best arrangement, but care should be taken not to allow limitations of lifting equipment to determine output. Where there is a tendency for work of a unit size to be produced, a continuity of flow to and from the Sandslinger can often be devised by the use of roller-track and ancillary lifting tackle. Fig. 7 shows such a roller-track layout, incorporating additional conveyors for the circulation of pattern-plates. By this method, the pattern is readily returned to the store if only one casting is required, but where more than one casting is wanted, it is an easy matter to recirculate the plate to the Sandslinger.

Rubbish Disposal

In a foundry, the disposal of rubbish can cause much inconvenience, both from the cost of handling and difficulties in storing until such time as it can be conveniently carted away. Dusty and dirty conditions usually prevail in the yard where rubbish is stored in the open. Fig. 8 shows a simple and reasonably inexpensive method of storing the rubbish under cover, which will show an immediate saving in labour and will help greatly to minimize dust, besides conserving storage area.

One of the main objects of this Paper has been to show the close relationship between moulding and handling equipment, and how the full benefit of one piece of machinery cannot be obtained without the introduction of other units to give the necessary flexibility in production, and to reduce manual effort to a reasonable minimum. It will, of course, be appreciated that it has been impossible to cover all aspects of foundry planning in such a short space of time, but it is to be hoped that the few examples of layout given will have shown clearly that simple methods can go a long way to increasing productivity.

University and Industry Conference

Industrialists in the Midlands attended with interest and profit on April 21, a conference at Birmingham University called by the Federation of British Industries in co-operation with the Birmingham Chamber of Commerce and the University, for what Sir Raymond Priestley, vice-chancellor of Birmingham University, labelled a "plain speaking and hard-hitting discussion on the products we turn out."

Sir Arthur Smout, president of the Birmingham Chamber of Commerce, said that industrialists were greatly perturbed at the ultra-concentration, and therefore, restricted character of modern university courses in this country. "The country's greatest need at the moment," he told the assembly, "is for inspired leadership, but you simply won't get inspired leadership from men who have spent their most formative years on nuclear physics and electronics." Saying that the curricula appears so overcrowded that the students have not had time to think, Sir Arthur said, "this concentration in narrow channels is most definitely not what industry wants," and added that in this respect our universities compare unfavourably with similar institutions in North America and on the Continent.

Insisting that he had great respect for the men who studied nuclear physics and electronics, Sir Arthur urged "bring the rest up in the classical school of Faraday with its sealing wax and string. It is this school which will solve the problems of the world." Referring to the disappointment that universities appear to feel because industry fails to clamour for their finished products, he suggested that not one university graduate in 100 was really fitted to do research work as he understood research. It would do the universities a power of good to push their graduates out on production, encouraging only a small percentage to return only after a few years' experience of the rough and tumble of life.

Preferential Treatment

Going on to assert that many new entrants into industry from the universities seemed to expect preferential treatment. Sir Arthur declared it should be remembered that works were not teaching institutions and no one engaged in them felt that he owed a living to every university graduate who crossed the threshold. In industry there was a most disconcerting habit of forgetting within six months a man's professional and university qualifications and of looking hard only at the way he does his job and the way he delivers the goods.

Concluding that no firm can afford to ignore the men already working with it who have come up the other way, Sir Arthur reminded his audience that among to-day's industrial leaders were many men who had "dragged themselves up by their shoestrings." These men industry must and would encourage because they were men with guts and character, and industry needs them more than ever before.

Mr. J. J. Gracie (of G. E. C. Witton), said that the greatest need for graduates to-day was in the production field, and in this sphere, Britain was lamentably behind America. If a graduate was put at a fairly low level on joining the company, his guts and character would show themselves if he had any.

Defending the university's point of view, Professor W. Moon (Nuclear Physics Dept., Birmingham University) said, he hated the "Ph.D." and would prefer to get rid of it, but did not think it possible. University authorities had much trouble in getting graduates to do other things.

Association of Bronze and Brass Founders

Annual General Meeting

The annual general meeting of the Association of Bronze and Brass Founders was held on Wednesday of last week at the Café Royal under the presidency of Mr. Geo. F. Mundell, who presented his valedictory address, in the course of which he said:

PRESIDENT'S REPORT

The past twelve months has been a very active time for the Council and other committees and the Association has been well served by its Committee Members, all meetings have been well attended. The Council have met regularly at about quarterly intervals; discussing and dealing with problems as they arose. The Council has lost the valuable counsel of Mr. J. C. Colquhoun and Mr. J. Fallows. The Bulletin, under the able Editorship of Mr. Smithson, has appeared regularly, and is a great asset to the members, keeping them in constant and up-to-date touch with all the news and activities of the Association; its pages are always open for members to express their views, or to pass on to other members the benefits of their experience.

Publicity

Membership has been increased by the admission of six firms. This seems to be the first fruits of the work of the enterprising publicity committee formed a year ago. The committee has re-drafted the booklet "Aims, Objects and Achievements" which is now a very attractive publication and has been sent to many prospective members; the committee has also produced some excellent notes for use when approaching non-member firms. It is hoped that all members will take every opportunity of getting such firms into the Association—in this matter the personal approach is extremely valuable. We must strengthen our Association financially; we have heard of the enviable situation of the French foundrymen's organization and of the ironfoundry associations in this country; but *we* must depend on increasing our members, there are many estimable firms who should be in our Association, it is to their benefit and ours that they should come in. The Trade Press has given us a great deal of valuable publicity and is helping the Association in many ways; on your behalf I would like to thank them warmly for their support. Last year the Non-Ferrous Founders Society of America was made an associate member of this Association. The American Society has now reciprocated by making this Association their first associate member. I am sure the link so formed will prove valuable and will ensure a cordial welcome for any of our members who may visit the United States.

Area meetings have been held in London, Wolverhampton, Manchester, Liverpool and Leeds. Members who attend these meetings find them of considerable value and interest. The London and Wolverhampton meetings particularly are well attended and a number of recommendations from these have been sent to the Council.

Controls

A year ago, all metals were extremely short and expensive; recently however, there has been an improvement in the supply of ingots. When the shortage seemed acute and the outlook dark the Association, with the encouragement of the Ministry of Supply, invited members to inform them of their output classified in end uses. Some 70 members have submitted such information month by month to the secretaries who have built-up a picture of the industry not previously available. Fortunately this information did not have to be used for the severe purpose of allocating supplies, but we have learnt much and thanks are due to those public-spirited firms who in these harassing times have taken the trouble to extract this and other information which has been requested. The Association also discussed voluntary control of ingot prices with the ingot makers and agreed with them in principle; the course of events, however, made the implementation of such an agreement unnecessary.

Sand Supplies

There is a threat to the potential supplies of Mansfield sand by the proposal of the Mansfield Council to build houses on land containing reserves of this sand. The Association has supported the appeal to the Ministry of Town and Country Planning made by the Mansfield Standard Sand Company, Limited. Mr. F. G. Burrell spent three days at the enquiry and gave evidence on behalf of the Association as did Mr. W. R. Marsland on behalf of the ironfounders. A successful outcome is hoped for, as it is important that all natural resources and supplies to the industry should be conserved and safeguarded. Thanks are due to Mr. Burrell and Mr. Marsland for the services rendered in this connection. Incidentally it is on occasions such as this that the value of trade associations is exemplified.

The Engineering and Allied Employers National Federation is setting up a standing foundry committee to advise on foundry wages and relevant matters. The committee is composed of three representatives of each of the four sections of the foundry industry—iron, steel, non-ferrous and light alloys; the Association's representatives being Mr. F. G. Burrell, Mr. W. S. Lawson and Mr. G. T. Hyslop. Allied to employment is recruitment and training; if the number of craftsmen shrinks the industry will be the poorer. We therefore welcome the enthusiasm in face of a period of discouragement shown by a number of firms, and also the move to establish on a national basis recognized training schemes, apprenticeships and indentures. The Association will support these moves fully.

Association of Bronze and Brass Founders

The Association's technical committee under its able chairman, Mr. P. D. Crowther, has had a busy year. Its members devote a great deal of time to the work, not only by attending the meetings but by representing the Association on other technical bodies, conducting investigations into matters germane to their work and interviewing and reporting; they deserve thanks and encouragement.

The research group of members supporting the British Non-Ferrous Research Association has grown to a strength of 33, contributing some £1,400 a year. These members get a valuable service for a very reasonable contribution because the scheme is organized in a corporate basis. It is one of which more members might with benefit avail themselves.

Productivity

The most important single event last year was the publication of the Brassfoundry Productivity Report as, for the forthcoming year, will be the conference on it to be held in June. So far some 8,000 copies of the Report have been sold and it is hoped to sell many more at the conference. This Association, feeling itself under a moral obligation to implement the work of the team, has undertaken full responsibility for the conference. It is earnestly hoped, therefore, that every member will give full support. It will be no pleasure trip but it can be confidently expected that much of value will be learned and that it will represent time and money well spent. Incidentally, it may be the last opportunity to meet and discuss such matters with the team; they have put in two years' hard work and one cannot expect them to continue to devote time to this activity, for much of this work has been done in what should have been their leisure hours. To the members of the team, therefore, and especially to their leader, Mr. Frank Hudson, members are greatly indebted as well as to their employers; to them we say most sincerely, "thank you" and I feel we can express our appreciation best by making their conference a success.

Finally I wish to express my deep sense of gratitude to the vice-president, Mr. Marsland, and all the members of the Council for the enthusiastic support they have given to the Association and myself during the past year. Council meetings have been well attended, and while we have not always carried into effect the recommendations sent from the area meetings, they have always been carefully and fully considered. To the secretaries, I once more say a very sincere word of thanks—without burden, instead of which, it has been an honour their support and advice which is always available, the position of president would be an intolerable and pleasure to serve.

This was followed by a report from the Technical Committee by Mr. P. D. Crowther, an abstract from which is given below.

TECHNICAL COMMITTEE REPORT

The Technical Committee of the Association has held its normal quarterly meetings during the past year; the attendance has been well maintained at an average of 14.

During the year the Committee's report "Metal Losses in the Foundry" was published. This was an interim report but coming most appropriately at a time when metal was very scarce and expensive the Committee feel it may have been of considerable value to members especially in indicating methods of minimizing losses and of recovering such losses as inevitably occur. Incidentally these reports are strictly limited to members and requests for copies from non-members are refused. It is the intention of the Committee to prepare a more advanced report on this subject in due course but to do this the co-operation of members in making tests and submitting results and observations will be required.

Standardization

An objective which has been constantly in view during the year has been the subject of standardization, especially of inspection procedures. The Committee feels, especially with the incidence of the re-armament programme, that much time, labour and material could be saved, if the requirements of the various bodies were co-ordinated and the functions of various inspectorates fused. Two members of the Committee, Mr. B. R. Higgins and Mr. R. Lancaster have done a great deal of work on this subject preparing memoranda and interviewing officials. Progress has been made. It was halted for a while as it was found that the Federation of British Industries were discussing the same subject with the Admiralty and the Ministry of Supply; their general recommendations however appear to have paved the way for our more detailed work, and it is anticipated that progress will now be made.

The Committee is working for the standardization of alloys and through its representatives on the B.S.I. committee watches this matter closely; at present it is examining a proposal to include a brazing metal in specification B.S. 1400 and to modify aluminium bronze AB2 by the introduction of an upper limit for lead. A sub-committee is also working on the preparation of a quite short booklet on B.S. 1400 alloys with the intention of making designers and others more familiar with them, guiding them to the more general alloys and superseding out-of-date references and names.

A "sticker" label for affixing to enquiries to serve the same purpose has been designed and will be available to members shortly—it will bear the Association crest and will help to advertise the Association and it is hoped it will be widely used.

On the subject of alloys, appreciation is expressed to those members who supplied information to the secretaries of their output in specifications. The summarized result, which appeared in the latest Bulletin, gave information not previously available, and indeed in some ways surprising, which will be of great value to the Committee. Another subject of standardization on which advice is being given is that of moulding boxes. This may lead to economies where standardization can be effected, but it is recognized that non-standard

boxes may, for many firms, conduce to more economical operation.

Miscellaneous

The proposals for a colour-code to identify the composition of ingots and cast stick has, regrettably, fallen through. A good deal of work has been put into this, but as it was impossible for the A.I.D. to adopt the proposed code for cast stick the B.S.I. reluctantly decided not to pursue the matter.

The opportunity afforded by the appointment of a committee to advise the Ministers of Supply and Materials on metal economy has been taken to draw their attention to the Association's recommendations for minimizing metal losses.

A number of members of the Committee are assessing the value of the fracture-test for gunmetal (85/5/5/5) evolved by the American Foundrymen's Society; sufficient tests have not yet been carried out to enable the Committee to pronounce on this matter, but it seems to have possibilities.

Three of the Committee were members of the Productivity team which produced the Brassfoundry Productivity Report; the Committee therefore have a keen interest in the Report which contains much of value technically, apart from its other aspects.

During the year the Committee lost with the greatest regret the services of Mr. B. S. Barham, who has gone to Australia. Mr. Barham was a member from the inception, he fully supported the Committee's work and was particularly knowledgeable on corrosion subjects. Welcomed as new members are Mr. E. Wallace, of Dewrance & Company, who replaces Mr. Barham, and Mr. D. H. Potts, of Westinghouse Brake & Signal Company, Limited.

The Chairman reported that he had decided, in view of the many calls on his time, that he should vacate the chair. The Committee was informed of this decision at their last meeting and Mr. R. Lancaster, of the Eyre Smelting Company, was elected chairman in his place, and no better choice could have been made. He had always played a prominent part in the Committee's activities and will be a sure guide in the work which lies ahead.

Finally, the chairman of the Technical Committee acknowledged the constant assistance which the secretaries have given during his three years in office.

Following the adoption of his report, a short talk was given by Mr. G. L. Bailey, C.B.E., on the work that is being carried out by the British Non-Ferrous Metals Research Association on copper-base alloys. Mr. Wormleighton then gave an interesting talk on recruitment including details of the activity of the craft school at West Bromwich and of the proposed national apprenticeship schemes.

Productivity Conference

Finally, much detailed information was given by Mr. Marsland, Mr. F. Hudson and Mr. Wormleighton about the forthcoming productivity conference to be held in Harrogate. The feature which aroused the major interest was the competition to be held on the costing, routing and general processing of a design of casting to be made available for all and sundry. The design, it is thought, will be suitable for making either as a sand cast ng or a die-casting. The details of this novel and very useful competition should soon be available. It was stressed that the conference is open to the whole of the industry and the support of concerns unattached to any employers' association will be warmly welcomed. The productivity team was a national venture and the implementation of the Report is likewise a national duty.

Election of Officers

After luncheon the annual business meeting was held. Mr. W. R. Marsland of Newman, Hender & Company, Limited, was elected *president* and Mr. G. A. Woodruff of J. Stone & Company Limited as *vice-president*. As *trustees* Mr. W. J. Lawson, Mr. George T. Hyslop and the *secretaries*, Heathcote & Coleman were re-elected. Mr. R. Lancaster of the Eyre Smelting Company was elected *chairman of the Technical Committee*. The *Council* was strengthened by the addition of Mr. F. G. Curtis, Mr. Buxton, Mr. Hobkirk and Mr. Woodruff. There were no changes in the other committees, and the auditors were re-elected.

Engineering Apprentices to Get More Pay

Wage increases varying from 5s. 6d. to 11s. a week are to be received by engineering apprentices and boys as from April 28 under an agreement reached between the Engineering and Allied Employers' National Federation and leaders of the Confederation of Shipbuilding and Engineering Unions.

A claim for an increase of £1 a week was recently submitted by the unions in support of which about 20,000 boys and apprentices went on strike in several parts of the country last month. The increases will benefit about 100,000 youths in federated firms, but many thousands more will be indirectly affected.

MEMBERS OF A CIVIC DELEGATION from Lille (France) last week visited leading works and factories in Leeds.

Hollow-ware Price Control Ends

The Board of Trade removed price control from all types of hollow-ware on April 24. The goods mainly concerned are enamelled steel hollow-ware, cast iron, tinned steel, and tinplate hollow-ware and galvanized hollow-ware, including goods treated with substitute finishes in place of galvanizing.

An announcement by the Board of Trade said that price control was being abolished because stocks were good and the outlook for raw material supplies was satisfactory.

A 12-YEAR-OLD RECORD for the production of iron has been broken at the Scunthorpe (Lincs) works of the Appleby-Frodingham Steel Company branch of United Steel Companies, Limited. In the last four-week period 76,220 tons—all on home-produced ore—were made.

Notes from the Branches

Newcastle-upon-Tyne

The annual general meeting of the Newcastle branch of the Institute of British Foundrymen was held on April 5, with Mr. C. Lashly, M.C., branch-president, in the chair. The hon. secretary in his report stated that the progress shown in recent years had been maintained during the session under review, and that, due to the efforts of the programme committee, an interesting and varied programme had been presented; membership in the higher grades had increased and attendance at branch meetings had been good.

In his presidential address Mr. Lashly took members back over the years to the formation of the branch in 1912, and it was evident from the extracts from the recorded minutes that the welfare of apprentices had been the concern of the branch throughout its history. The president emphasized that the need for encouraging youth into the industry was never more urgent, and that the education of apprentices was of prime importance to the future of the industry. The report indicated that members of the branch had visited Darlington Forge, Limited, on October 13 last year. In November, Mr. W. B. Lawrie, M.SC., H.M. Inspector of Factories, presented his film on dust flow. A successful informal dinner was held on November 2 at which Mr. and Mrs. Colin Gresty were the chief guests, and it was hoped that an annual dinner may again become a regular feature in the branch programme.

In December, Mr. N. Charlton, a past-president and a member of the branch, gave a summary of his Paper entitled "Production of Heavy Castings for Electrical Generating Equipment," and also showed a film on the mechanization of the foundries of C. A. Parsons & Company, Limited. The meeting in January was a special occasion in that Mr. Colin Gresty, a member of the branch, paid a visit in an official capacity as president of the Institute. He was accompanied by Mr. T. Makemson, M.B.E., general secretary. The guests were welcomed by the branch president, and in reply Mr. Gresty expressed his pleasure at visiting his own branch as president of the Institute, and took the opportunity of thanking all those members who were responsible for giving his year of office such a splendid start with the Conference in June last. A debate under the title of "Foundry Facts" was then held, and questions and statements on foundry matters were the subject of open debate. Mr. C. Gresty, Mr. T. Makemson and Mr. W. Scott acted as arbiters.

Members had the privilege of visiting the foundry of Charles W. Taylor & Son, Limited, of South Shields, during the afternoon of February 9. All who participated in the visit had a most interesting afternoon, and were greatly impressed by the high standard of craftsmanship in the making of propellers, and marine engine castings. The thanks of the branch are due to the company for their hospitality. In March the branch, through the kindness of Prof. A. Preece, M.SC., F.I.M., held a joint meeting with the department of metallurgy, King's College, when two students gave details of research work, connected with the foundry craft, which was carried out by them at the College. This innovation was welcomed by the branch president, who expressed the hope that this would be the forerunner of many joint meetings which would strengthen the link between the Institute and the University. After the discussion the laboratories were open to inspection by members.

After the presentation of the financial report on the proposal of Mr. D. Walker, seconded by Mr. E. Smith, the following members were elected to office for the session 1952-53:—*As president,* Mr. G. Elston; *as senior vice-president,* Prof A. Preece, M.SC., F.I.M.; *as junior vice-president,* Mr. R. F. Hudson; *as members of branch council,* Mr. C. Nicholls, Mr. G. Pollock (re-elected); Mr. J. J. Collin, Mr. J. G. Dodds, Mr. W. S. Paulin. Prof. A. Preece agreed to act as representative to the general council and Mr. G. Elston and Mr. R. F. Hudson as representatives to the technical committee. A vote of thanks to the retiring president was proposed by Mr. G. Elston.

In conclusion, as a result of the Short Paper Competition announced in November, two short Papers were given by members of the branch: "Knock-off Feeding Heads," by Mr. J. R. Robinson, and "Production of Castings in Aluminium Bronze, D.T.D. 412," by Mr. L. Hargreaves. These practical Papers were appreciated by members present, prizes being awarded to both authors. A lengthy discussion followed the Papers and the president proposed a vote of thanks to the competitors.

Lancashire

At a recent meeting of the Lancashire branch of the Institute of British Foundrymen, at St. Helens gas showrooms, a lecture was given by Mr. J. A. Reynolds (of British Insulated Callender's Cables, Limited) on "Gating and Feeding Systems." Mr. F. Rigby Pritchard presided. After explaining the theories underlying the uses of runners and feeders, the lecturer showed slides illustrating the effect of various methods applicable to the production of sound castings in steel, malleable cast iron, grey iron, manganese-bronze and aluminium-bronze. The president of the Lancashire branch, Mr. R. Yeoman, and several local foundry executives (including Mr. R. Woodcock and Mr. Capper (Appleton and Howard), took part in the lively discussion which ensued. Mr. George Varley proposed the vote of thanks and referred to the idea of forming a Merseyside section of the Lancashire branch.

New Catalogues

Pneumatic Scaling Hammers. A leaflet received from Holman Brothers, Limited, Camborne, describes a range of three sizes of pneumatic scaling hammers which operate with tungsten-carbide tips. Using air pressure of 80 lb. per sq. in., either 4,500 or 6,000 blows per min. are struck.

Pulling and Lifting. G. E. Simm Engineering, Limited, East Parade, Sheffield, 1, have sent us a folder describing a machine—or should it be called a tool for it weighs but 36 lb.—which appears to do the work of a winch or tackle or both. For a description of the machine the reviewer has taken the liberty of quoting from it. "The machine consists of two pairs of automatic jaws enclosed in a casing, which grip the cable. These two pairs of jaws move in opposite directions along a sleeve. The cable advances continuously during their movement because their automatic action enables them to grip the cable while they move in one direction, whereas it slides through the jaws, while they move in the opposite direction, after the fashion of the free-wheel mechanism of a bicycle." The folder is quite a neat production and it can be had by writing to Sheffield.

A REPORT on Brass Manufactures, one of the reports on the Board of Trade's Census of Production for 1948, is now obtainable at the Stationery Office, or at any bookseller, price 2s. 6d.

Requirements of Machine-shop Inspection*

Discussion of the Paper by Mr. C. Walker and Mr. F. H. Greenwood

The Paper had enumerated many aspects of foundry production from the viewpoint of the large buyer of castings and, in the discussion reported below, foundrymen put forward explanations and contra-suggestions. Major attention was given to variation in weight from piece to piece and scope for research on this matter was disclosed. Other points dealt with included co-operative attitudes now obtaining between buyer and seller of castings and the postulated advantage of specialization in "tied" foundries, as compared with the British type of automobile foundry where, more usually, several large customers are catered for.

After presenting the above Paper at a meeting of the East Midlands branch of the Institute of British Foundrymen, the Authors were thanked for their novel contributions and the meeting was then opened for discussion:—

MR. BUCKLAND said the Authors were fortunate in working for a company which was one of the best in the country from the point of view of co-operation with the foundryman. It was Vauxhall's desire to satisfy the engineer, the planning engineer, the designer, the inspector and the foundryman in the early stages. This was most important, and he felt sure that the foundry industry generally would be better off if other customers did the same thing. Mr. Greenwood emphasized that co-operation between suppliers and customers was essential, and no doubt he would be the first to agree that it was also essential for customers to co-operate with suppliers by visiting them in their own works, and appreciating their difficulties. Out of these visits often some suggestion arose to mutual benefit.

Mr. Greenwood had emphasized that, later on sometimes the foundryman came along after castings were in production and said something had gone wrong and it was necessary to make an alteration. On the other hand, he thought he would also agree the engineer or the planning engineer likewise belatedly discovered that a casting was a little weak in places, so it was not always the foundryman who required an alteration. As far as foundrymen were concerned, they were reasonably satisfied with their efforts. They sometimes got figures of 95, 97 or even 99 per cent. really good castings. Would Mr. Greenwood be satisfied if even 99 per cent. of the cars were good cars?

MR. GREENWOOD said that, if only 99 per cent. of the vehicles were good ones, makers would soon be short of work. It was only the bad ones one heard about and about what few there were, much was heard internally. They were all supposed to be good.

Surplus Metal

Regarding his mention of 3 lb. of surplus metal, the weight problem or variation was an acute "headache" to the manufacturer. If all castings, also standards, and all materials varied to that extent they would not be able to produce a vehicle in the weight class sought. In the passenger-vehicle market, it was possible to issue cars at so much a lb. Some time ago a Vauxhall "12" cost 43d. per lb. and a "Velox" 44.9d. per lb., the weight of the "12" being over 2,000 lb. Wherever there was more weight there was more work for the engine; with the addition of a few pounds, a "12" would soon be a "14." A "14" was heavier and heavier tyres and so on then would be needed.

Regarding modifications, Mr. Buckland probably only heard one side of the question. If there was a modification to a casting after it had been approved it was a subject of an engineering change, and this had to be approved all the way through the organization. If the engineers needed to add something, people want to know why if it means extra cost. He quite appreciated that sometimes a modification was made which just upset the foundry, and this was where personal contact came into the picture, and both parties must realize it was no use saying "Yes we agree to the modification," and then later, "We cannot."

MR RUSSELL said he did not want it thought that he was trying "to wriggle out" of the just criticisms which had been handed to the foundrymen, but on an early illustration comparing weights of castings of ¼ cwt., was it not possible this was due to a difference in the patterns? From identical drawings two firms of patternmakers could vary the weight of a casting quite considerably. In fact, variation could occur even at the same patternmaking firm, since two patternmakers could rarely produce a complicated casting to identical thickness in every section.

MR. GREENWOOD said what was shown in the illustration indicated that it did happen, and the only explanation he could put forward was that the standard of measurement must vary! Why craftsmen could not make two patterns reasonably the same he could not understand. It might be pattern making in wood or metal, but he could not see any reason why there should be a huge variation in the casting—an inch was an inch when all was said and done. It only went to show the working tolerances were unsuitable. He understood there was a foundry in the North which produced cast-iron pistons and machined them: they did not balance for weight and yet they were uniform. They had realized that patterns vary, but before putting a new set of equipment into production they had a

* Paper printed in the JOURNAL, April 24, 1952.

trial run. If any variation occurred that was adjusted before putting the job into bulk production.

Weight Differences

MR. ROXBURGH, referring to the question of weight, asked Mr. Greenwood when the suppliers of castings were supplied 5 lb. over weight, what action was taken, because in many cases foundries were bound to work to an agreed weight. When samples were made and the weight was presumably higher than indicated by the drawing, that casting must be sectioned and examined and if any sections were thicker than the drawing stated the pattern and corebox must be altered. From personal experience with one of the Authors, an agreed weight was specified. In many cases this had been done provided that liaison was established in the early stages. With certain types of material there must be minimum thickness. He felt that in the case of the particular example which Mr. Greenwood had brought along, if personal investigation had been made properly with the supplier, steps could have been taken to reduce the difference.

MR. WALKER said this variation in weight of castings was rather a difficult subject, but it was a foundry problem, not his. All he did was to point out the variation which occurred. His department worked to limits agreed by the engineering department and the foundry before going into production, but one foundry did vary from another. It might be caused by different methods. How foundries solved their problem was their business but customers were concerned about the extra weight they had to pay for. It was a very important point to note as customers they were getting unwanted metal and it was up to the foundry to devise ways and means of getting together to agree on the proper weight and provide castings which were uniform and within the tolerances as laid down by the customer's engineering department.

MR. ROXBURGH said that his foundry checked the average weight of every casting each week, so that they were satisfied with this aspect.

MR. WALKER said he was not referring to any particular foundry, as the weight figure variations which were shown happened with different sources of supply.

MR. SMITH pointed out that if the buyer had paid so much each instead of so much per ton they would have been better off.

MR. GARDOM said it was 20 years since he had dealings with casting inspectors and they seem to have greatly improved since. He was almost disappointed as they did not seem to be so convincing. On this question of weight variation, were the castings the first received and not the ones in general supply? Did designers dare, on new drawings, to put on the weight expected for the rough casting so that the foundry could check it, or did they, on receiving the first castings, take the best of any three suppliers and force the others down? What was the percentage of rejects, and what should buyers expect to get?

Changed Conditions

MR. GREENWOOD, referring to the first remarks, said he must agree that matters were not so convincingly put now as 20 years ago. The whole labour situation had changed. One could not use the same methods now, that one did then; in fact the sergeant-major principle had gone out. The two castings quoted were samples taken from bulk supplies, which did show up some falling off in the accuracy of section thickness. The sections were increasing badly enough to have the machining allowances increased. A figure of $\frac{3}{32}$ in. was quite adequate for machining. The sectioning of a casting was the only way to check up internally, and having cut one up it could not be used. Regarding the weight of the casting being shown on the drawing, that was not his practice. He would like to see a draughtsman or engineer brave enough to design an intricate casting weighing 80 lb. and then designate at 80 lb. plus or minus 1 lb. When initial samples were received, the weight was recorded and also the weight of machined casting. Percentages of rejects were recorded as low as 0.4, but these were from foundries where good control was exercised and the concerns were run on a profit-making basis, round about $\frac{1}{4}$ to 2 per cent. was normal. In 1939, on a very intricate casting weighing 180 lb., his firm machined 38,631 castings with 1.33 per cent. scrap. The rejects were higher to-day and a retrogression was noted. It was necessary to return a lower rejection percentage. The machine-shops were now operating at about 2 per cent., and less, whether it was due to the shorter week or the coke or the sand he did not know.

American Comparison

MR. MARSHALL, discussing the problem of weight variation in castings, thought what Mr. Gardom was trying to ask was what was accepted as a good standard. With regard to the 5-lb. variation in weight on a big casting, what would be considered a reasonable variation? It was possible that one casting was well over the accepted average and the other below, *i.e.*, perhaps not more than 3 per cent. error. The standard of inspection that was generally used in the motor industry was not always based on the utilitarian angle. Much was heard as to the efficiency of American foundries, as for instance the very low scrap percentages. Thus, it appeared reasonable that the American motor industry used castings which would not be accepted in this country. Also, it was recognized that castings sold as service parts were subject to a high standard of inspection. With regard to the local hardness showing on the end flange of the grey-iron part illustrated, similar castings were made in malleable iron with no difficulty.

MR. GREENWOOD said in such a case, when that particular component was in malleable, there was no need to mention it. As regards inspection of service parts, and the standard of inspection, it was possible that it was higher because of the fact that, when one bought a component over the counter, if one saw some slight defect, one would not like it, whether

it affected the serviceability or not. While that component might be 100 per cent. good enough for the job, it was not always visually perfect.

As to standards of inspection in America, he said that at one time his firm had some major castings imported from the States, and the rejects on these were infinitesimal, 0.5 per cent. Variation in weight had just got to be stopped or it would get out of hand. One could take it that, generally, American castings were better than British, and he did not think it was all our fault. They had better iron and their coke was more regular. With regard to American supplies, one must regard the matter in the right perspective. When they were producing a cylinder-block, for instance, it was planned and they decided how they were going to make it; modifications were made early on instead of late. The plant was laid out for high output and, if spending money was going to earn money, they spent it with a view that after the point where the cost of the equipment had been saved, then further production gave a higher margin of profit. In this country he did not think there was one single foundry producing only one type of cylinder-block casting. He believed founders in this country who made cylinder-blocks had a variety of blocks to make and that governed their equipment, and with the equipment which they used they were doing the best they could, but the car makers required something better. They had to sell vehicles in the days ahead and they must be better and cheaper.

Few Tied Foundries

MR. HILL said that in the making of castings for the automobile industry, two factors have frequently crossed his mind; one was the most rigid specifications imposed, and the other was that so few automobile firms seemed to have their own foundries, and those who had, still passed-on quite a large quantity of work. Could it be that these two factors were associated, and that, from the outset, they had realized that in making castings to the specifications demanded, it was far better to let someone else have the responsibility for meeting them?

If this were so, then they should endeavour to appreciate some of the founders' problems, and be a little tolerant when castings manufacturers did not always meet a given specification. What should be appreciated was that in a machining operation, one worked from the outside inwards, and that in making a casting one worked from the inside outwards. That was, a casting made within specified limits was machined to a definite size, and the founder started with a definite size, *i.e.*, the pattern, in which certain allowances had been made for contraction, mould conditions, etc., and *hoped* to finish with a size somewhere between specified limits. The number of factors influencing the size and weight of the finished casting were far greater than the factors influencing the machining of a casting to a given size.

To quote an example, moulds for a casting weighing approximately 80 lb. rammed to a given mould-hardness were poured in 13 secs. and 17 secs., and it was found that the resultant castings from the moulds poured in 13 secs. were 4 to 5 lb. heavier than those poured in 17 secs., the increased pressure due to the quicker pouring time accounting for the variation. It would be appreciated, therefore, that apart from the more obvious factors which produced variations, even the speed of pouring could effect size and weight. Variations in weight of this nature, which must mean a variation in section at some part of the castings, were not always associated with variations at jig location points, but frequently occurred on the body of a casting, and within limits one could expect such variations.

MR. GREENWOOD said there were very few motor firms which had their own foundries; in fact, the speaker had answered his own question. One or two had foundries, but Vauxhall's had not. No matter what founders did in their shops, how they rammed, or what rate they poured, it was just their problem. Experienced foundrymen should be able to recognize whether they could make the casting as it appeared on the drawing. Any modifications required should be voiced at the design stage and not after delivery.

MR. MYERS, speaking from a moulder's point of view as to the weight of castings from certain shops, said much depended on the method of payment. If in one shop the men received a price for the casting, a constant weight resulted, but in a mass-production shop with a bonus entirely on weight, a heavier casting might result.

Catering for Shrinkage

By "Coroner"

Usually when waster castings occur it is a comparatively easy matter to diagnose the cause of the trouble and institute means of preventing reoccurrence in the future. There are, however, rare occasions when what at first is considered to be the cause of the trouble is afterwards found to be a wrong diagnosis. Such a case concerned a number of sole- or bed-plate castings of very light weight yet large size scantlings, which were coming out cracked at the juncture of the plate of metal with the sides. These beds had never previously given trouble from this cause and as the metal mixture had been altered to enable available brands of pig and scrap to be used, it was thought that this was the cause of the trouble. Reverting to the previous metal mixture for the next batch of castings failed to effect a cure of the trouble, for these too were fractured in the same place.

Thus the real cause of the trouble had to be sought elsewhere and it was then found that to enable the casting to be more easily removed from the top moulding-box after cooling, cast-iron grids had been substituted for the wrought iron or mild steel hooks or gaggers previously used. Unfortunately, the moulder responsible for the cast-iron grids made them with insufficient clearance around the casting and thus, on cooling, the sides connected with the plate of metal situated at the bottom of the mould could not follow the contraction of the plate and so fractured.

By making the grids slightly smaller and also placing a layer of straw-rope or coconut-yarn around them obviated any further trouble, as the rope or yarn was charred away and left room for the casting to contract. This is but another of the various examples often encountered of the moulder failing to appreciate the need for an allowance for the contraction of light castings where they are of considerable length.

Personal

MR. W. H. HIGGINBOTHAM, chairman of Edgar Allen & Company, Limited, steel manufacturers, of Sheffield, has been elected a vice-president of the Association of Special Libraries and Information Bureaux.

MR. CHARLES PARRY, manager of the Templetown coke works of the Consett Iron Company, Limited (Co. Durham), since 1946, has received a presentation from his colleagues to mark his retirement, after 50 years' service with the Company.

MR. G. R. JAMESON, for the past four years works manager of the Reynolds Light Alloys, Limited, factory, leaves this month to take up a post in California as plant manager of a new factory belonging to the American Harvey Machine Company.

MR. E. KERMETH, manager of the Simplex Electric Company's Broadwell works and foundry at Oldbury, is leaving to take up a similar appointment with Metters, Limited, ironfounders, in Australia. Mr. Kermeth's successor at Oldbury will be MR. A. C. GARDINER.

MR. I. REES, who joined Fine Castings, Limited, Bristol, when the Company was founded in 1921, is retiring from the position of works manager which he has held for the past 28 years. He will continue to act in an advisory capacity and retains his seat on the Board, to which he was appointed in 1947.

MR. TOM KIRKPATRICK and his son, James, have been appointed works manager and deputy works manager, respectively, of Hurst Nelson & Company, Limited, wagon builders, Motherwell. The appointments were made following the recent death of Mr. Thomas McPherson, who had held the post of works manager since the first world war.

VISCOUNT WEIR has been elected hon. president of the British Employers' Confederation, with Mr. A. G. Stewart as president, and Mr. Charles Connell, vice-president. Mr. Stewart is chairman and managing director of Stewarts & Lloyd's Limited, and a member of the executive committee of the British Iron and Steel Federation. Mr. Connell is chairman of Chas. Connell & Company, Limited, shipbuilders, Glasgow, a past-president of the Shipbuilding Employers' Federation, and president of the Shipbuilding Conference.

WITH THE MERGER between Horseley Bridge & Thomas Piggott, Limited, and Carter-Horseley (Engineers), Limited, MR. JOHN V. SHEFFIELD, chairman, and MR. VINCENT SENIOR, joint managing director of Carter-Horseley, have joined the board of Horseley Bridge & Thomas Piggott, Limited, Mr. Sheffield as deputy director. MR. JOHN W. BAILLIE, joint managing director, has resigned from the board of Carter-Horseley (Engineers), Limited, but continues as managing director of the parent company, Horseley Bridge & Thomas Piggott, Limited.

IR. J. H. WIERSUM, who has been appointed to succeed Mr. H. F. Bibby as manager of the office of Metropolitan-Vickers Electrical Export Company, Limited, at The Hague, graduated in electrical engineering at Delft University in 1938 and joined M-V the same year as a special trainee. On completion of his course he was appointed to the staff of motor engineering department, where he remained until April 1, 1942, when he took a commission in the Royal Netherlands Navy. Mr. Wiersum joined the M-V Export Company, London, in November, 1945, since when he has been directly concerned with the company's trade with the Netherlands.

New Magnetic Thickness Gauge

A magnetic thickness gauge of new design has been developed by E. G. Harrison, M.Sc., of the research department of the Railway Executive (British Railways), Derby. The thickness of non-magnetic coatings on magnetic base metals is determined, as in other instruments, by the force of adhesion of a small magnetic element or armature to the surface. In existing designs this force is balanced by means of a gravitational couple, spring tension or electromagnetic pull. The instrument, which is described in the Journal of Scientific Instruments for March, employs a movable permanent magnet to produce the balancing force, but the same magnet also serves to energize the armature which is of soft iron, by induction. Movement of the permanent magnet towards the armature causes an increase in both the force of adhesion and the balancing force: the latter, however, increases more rapidly and there is a unique position at which the armature is released for any given coating thickness.

North East Coast Engineers' President

Newly-elected president of the North East Coast Institution of Engineers and Shipbuilders for the year 1952-53 is Lieut-Colonel T. Eustace Smith, joint managing director of Smith's Dock Company, Limited, North Shields. The fifth generation of the family to be connected with Smith's Dock Company, Colonel Smith joined the firm 29 years ago, and became a director in 1928. In 1945 he was made assistant managing director, his present appointment being made four years ago.

Mr. J. Leslie Batey, naval architect, R. & W. Hawthorn, Leslie & Company, Limited, Hebburn; Mr. G. R. Edgar, principal surveyor, Lloyd's Register of Shipping, Newcastle-upon-Tyne; Mr. J. B. Kerr, managing director of the Wallsend Slipway & Engineering Company, Limited; and Mr. R. Cyril Thompson, chairman of Joseph L. Thompson & Sons, Limited, have been elected vice-presidents of the Institution.

Long Service Awards

Recipients qualifying for awards in honour of 30 years' service with the Bilston firm, Joseph Sankey & Sons, at the recent ceremony of presentation, included Colonel H. B. Sankey, chairman and managing director; Mr. Ronald Sankey, deputy managing director; and Mr. E. P. Peel, secretary.

Col. Sankey being abroad, Mr. Ronald Sankey distributed the awards and presented a cheque of £100 to a timekeeper at the Albert Street Works, Mr. John Talbot, who is the third veteran to achieve 60 years' service with the firm since long-service presentations were first given in 1934. A total of 125 awards were made at the ceremony, bringing the grand total of veterans to 2,416, representing 6,990 years' service.

Association Technique, Annual Meeting.—At the annual meeting of the *Association Technique de Fonderie*, over which Mr. D. Waeles presided, Mr. Paul Muguet was elected president. Mr. Muguet is manager of the Société de Commentry, Fourchambault, Decazeville. The vice-president is Mr. Gustave Rivoire, the hon. secretary Mr. André Debar, the treasurer Mr. Henri Prevost, who is assisted by Mr. Edmond Moustacs. Amongst subscribing firms elected was H. J. Maybrey & Company, Limited, of London.

Malleable Castings in Western Germany*

By H. Moehl

About 86 per cent. of the German malleable iron foundry capacity is located in the Western Zone and the production of the industry in this area prior to the partition of Germany was roughly:—1936, 94,000 *tonnes*†; 1939, 133,000; and 1943, 171,000 *tonnes*. After the end of the war the annual production in the Western Zone was as follows:—

1946	30,007 *tonnes*	1949	83,152 *tonnes*
1947	32,948 ,,	1950	95,052 ,,
1948	54,576 ,,	1951	127,667 ,,

The average monthly production in June, 1951, amounted to 10,639 *tonnes*, the highest post-war monthly output being in October, 1951, at the rate of 12,038 *tonnes*.

The personnel employed in the malleable iron castings industry in Western Germany has increased as follows:—

At December 31, 1949	11,636 persons
,, December 31, 1950	13,604 ,,
,, June 30, 1951	14,050 ,,

The manpower figures for December 31, 1951, are not yet available.

The capacity of the 99 malleable foundries located in the Western Zone (before the war Germany possessed 113 such foundries of which 101 were in what is now the Western Zone) is rated at 138,000 *tonnes* per annum, *i.e.*, 11,500 *tonnes* per month. However, this output can be greatly expanded (consider for example the production in the year 1943 and the month of October, 1951) and it is difficult to estimate exactly what the industry's highest capacity may in fact be. However, accepting the rated capacity as 138,000 *tonnes* per annum, the following table gives the percentages of capacity at which the German foundry industry has been operating since the end of the war:—

Year	*Malleable castings per cent.*	*Iron, steel and malleable castings per cent.*	*Year*	*Malleable castings per cent.*	*Iron, steel and malleable castings per cent.*
1946 ..	21.8	17.9	1949 ..	60.2	52.9
1947 ..	23.9	21	1950 ..	68.9	68
1948 ..	39.5	34	1951 ..	92.5	87.3

Taking the output of all German industry in 1936 as a basis of 100, the equivalent figure for total industrial production in the Western Zone during 1951 is 130. For malleable castings the equivalent figure is 136 and for all iron, steel and malleable castings together is 112.4.

On the average between the years 1919 to 1937 malleable castings represented 4 per cent. of the total production of ferrous metal castings. In the post-war years the ratio has been as follows:—

1946	5.3 per cent.	1949	5 per cent.
1947	5 per cent.	1950	4.4 per cent.
1948	5.1 per cent.	1951	4.6 per cent.

Orders placed for malleable iron castings in 1950 amounted to 104,483 *tonnes* and in 1951 to 115,132 *tonnes*. Material delivered amounted to 82,783 *tonnes* and 109,916 *tonnes*, respectively.

Outstanding orders have amounted to:—

On January 1, 1951	36,139 *tonnes*
January 1, 1952	41,355 ,,

and reckoning that in 1951 the average monthly output amounted to 10,639 *tonnes* the order books carry work for some 3.9 months ahead.

"Wasters" in the malleable iron industry are running at about 6 to 8 per cent.; unfortunately, rather higher than before the war. This figure is based upon results submitted by foundries producing items of between 0.8 and 2 kgms. in weight. In many instances, in the production of pipe fittings, motor-cycle parts, etc., the figure is higher.

The yield of good castings (weight of satisfactory castings: weight of liquid iron) over the whole industry has remained fairly constant at about 48 per cent. over the years 1947-1950, but occasionally has dropped to lower figures. From January to October, 1951, for example, according to the monthly returns the yield had dropped to only 43.5 per cent., but this was because some of the producers of pipe fittings, etc., had apparently quoted their recoveries in finished weight: weight of liquid iron, that is, raw materials *less* the fettling loss. If these works are left out of account the yield figure becomes 48.7 per cent.

In general terms the manning schedule of the German malleable iron foundries is as follows:—

Moulders	33 per cent.
Coremakers	13 ,,
Fettlers	10 ,,
Melters	4 ,,
Heat Treaters	5 ,,
Patternmakers	7 ,,
Sand mill, shake-out, etc.	28 ,,

The ratio of staff to workmen is about 1.1:10. (These figures will, of course, vary according to the product, the number of cores and the amount of fettling required, etc.)

If general costs of production in 1936 are used as a basis of 100, then in the second half of 1948 these costs had risen to 184. At this level the production costs were held steady up to the end of 1950, although during this time the price of many raw materials and other items rose sharply, and in the same period the level of wages and salaries was also advanced. Practically the same developments took place in the grey iron and steel founding trades. In spite of these numerous price and wage increases, however, it was possible to keep production costs steady up to the end of 1950 for these two reasons:—

(1) On the average during 1948 the industry was only working to 40 per cent. capacity. This rose to 60 per cent. in 1949 and lay in the region of 69 per cent. in 1950. In the year 1951 the industry worked to full capacity. Through this steady increase in efficiency a decrease in operating costs was maintained, which—

* An abridged translation of an article published in *Die Giesserei*.

† One *tonne* is about 2,200 lb.

Malleable Castings in Western Germany

(2) in conjunction with the steady rise in output which took place in many areas during the years 1949-1950 compensated for the increase in prices during the same period.

The productivity of the German malleable iron castings industry, expressed in weight of satisfactory castings per man per month, has been as follows:—

Before the war	1,000 kgm./man/month
Second half, 1948	650 ,, ,,
Year 1949	730 ,, ,,
Year 1950	850 ,, ,,
Year 1951	915 ,, ,,

Development within the industry was interrupted by the large increases in the price of raw materials and services which took place at the end of 1950. Since December 1, 1950, prices have increased as follows:—

	In comparison with 1939
Pig iron by 58 per cent.	226 per cent.
Scrap by 60 to 90 per cent.	250 to 300 per cent.
Foundry coke by 56½ per cent. ..	300 per cent.

In addition, the price of the usual services was also raised, including freight charges which play a large part in the economy of this trade. From February, 1951, and later after October 1, 1951, wages and salaries were advanced to 20 per cent. above the 1950 level. Statutory holidays were extended from six days to 11 days, accounting for 4 per cent. instead of 2 per cent. of the wages bill.

These increases in prices and wages brought about a sharp upward movement in operating costs. It is impossible to quote an average cost figure for the year 1951; the year has to be divided into three parts, and three separate cost averages worked out:—

(1) For the first half of 1951;

(2) For the third quarter of 1951; and

(3) For the last quarter of 1951.

Compared with 1950, costs rose by 11 per cent. in the first half of 1951, by 21 per cent. in the third quarter, and by 31 per cent. in the last quarter.

Since the industry was now working at full capacity it was impossible to offset working costs by improved efficiency; on the contrary, due to the shortage of pig-iron and fuel, difficulties and checks in production were experienced which tended to increase the overall production costs and made it impossible to maintain the level of production attained hitherto. The following figures show how the costs, efficiency and productivity of the industry have varied in recent periods, taking the same figures for 1939 to be 100 in each case.

	Costs	*Capacity per cent.*	*Productivity*
1937	173	24	40
Second half—1948	184	40	65
1949	184	60	73
1950	184	69	85
First half—1951 ..	204		
Third quarter—1951	222	93	92
Last quarter—1951	241		

The increases in the prices of raw materials and services, and the increase in wages in detail are as follows:—

(Based on 1939 prices = 100.)

	1950	*1st half* 1951	*3rd qtr.* 1951	*Last qtr.* 1951
Pig-iron, scrap	197	248	314	344
Wages and salaries ..	187	202	204	215
Social services	248	282	282	290
Solid fuel	200	257	286	357
Electricity, gas, water ..	158	184	184	190
Other materials	128	152	157	179
Maintenance	250	250	250	250
Taxes, etc.	156	156	156	156
Sundries	161	161	202	219
Amortisation	300	300	300	300
Average	184	204	222	241
(1950 =	100	111	121	131)

Based on the figures shown above the operating costs over the four periods are:—

(Based on 1939 costs = 100.)

	1950	1/1951	3/1951	4/1951
General materials ..	197	248	314	344
Melting costs	184	194	228	245
Iron costs	190	276	288	308
Moulding and fettling wages	143	157	157	167
Total founding costs ..	206	227	228	256
Heat treatment costs ..	171	190	209	228
Finishing costs	180	204	221	242
Administration, etc. ..	221	226	226	229
Total costs	184	204	221	241

The consumption of material, fuel, etc., for the production of 1,000 kgms. of good malleable castings are on the average as follows:—

Pig-iron	550 kgm.	
Scrap	550 kgm.	
Fuels—		
Foundry coke	400 kgm.	(in terms of coal used)
Malleabilising	650 kgm.	
Mould and core ovens	150 kgm.	
Total fuels	1,200 kgm.	
Moulding and core sand	800 kgm. (approx.)	

Income from the sale of malleable iron castings in Germany has risen during the post-war period in the manner shown below, in comparison with production costs which are placed alongside.

	Sales income	*Production cost*
1939	100	100
2/1948	195	184
1949	191	184
1950	173 !	184
1/1951	197	204
3/1951	222	222
4/1951	—	241

The sudden drop in the sales of malleable castings in 1950 was due to the depression in German industry which lasted for a short period during that year.

In general, it appears that the pricing of malleable iron castings in Germany has lagged behind the rise in production costs which has taken place over the past two or three years. In June, 1951, production costs had risen to 111 per cent. of the figure for 1949, whereas the price index had only gone up to 104 to 108 per cent. of the 1949 figure; in September, 1951, costs had risen to 121 per cent. and prices only as far as 111 to 113 per cent. of the 1949 level. The Author concludes his statistical survey with an appeal for closer collaboration among German malleable ironfounders to give more reliable data regarding actual production costs in order to remedy this state of affairs.

TWO CONTRACTS amounting to nearly $500,000 (£178,570) have been obtained by the American offices of Thermotank, Limited, air-conditioning consultants and engineers, of Glasgow.

From Pickle Plant to Inspection*

By J. Eccleston

Although there are many stages between the pickling plant and the inspection department, the writer has endeavoured not to deal at length with the methods widely adopted in enamelling. Instead an attempt has been made to introduce several ideas and suggestions which are assumed to be untried, so far, and a section has been included on cast-iron enamels.

Pickling

Pickling, because of its unpalatable nature, is usually performed in a remote part of the works and, for this reason, often escapes the close supervision necessary for success. Nevertheless, without a clean foundation, successful enamelling is impossible. As a preliminary grease remover, some works employ an organic solvent, such as trichlorethylene, which readily vaporizes to a heavier-than-air vapour, the liquid being contained in a sunken pit and vaporized by means of steam coils. The value of this primary degreaser may be readily appreciated where the ware is coated with oil from the press as this is often insoluble in the principal degreaser, and either scums the surface of the solution, or deposits a graphite-like precipitate on the work baskets and work. Despite a continuous-running hot-water rinse next to the degreaser, ultimate carry over of contaminants into the acid is almost inevitable.

Hot sulphuric acid is generally preferred to hydrochloric acid for principal pickling but its present use in this country is gravely menaced by the sulphur shortage. In view of this, every effort must be made to conserve the new meagre ration. One method could be to remove the iron salts from the solution and hence eliminate waste altogether. Another method is greatly to accelerate the pickling. The most appealing proposition, whereby both these objectives would be achieved, is to employ electrolytic pickling, the ware to be pickled being connected to the one electrode and the other electrode inserted into the solution. An electric current slightly greater than the back electro-motive force would then be passed through the system. The former electrode would need to be the anode and the latter the cathode.

The action could be represented thus :—

$$H_2SO_4 \rightarrow 2H^+ + \overline{SO_4}$$

Then at the anode, there is :—

$$\overline{SO_4} \rightarrow SO_4 + Fe \rightarrow FeSO_4$$

and, at the cathode :—

$$2H^+ \rightarrow H_2 \uparrow$$

In words, the sulphuric acid molecule dissociates into hydrogen and sulphate radicle ions, the latter, being negatively charged, are attracted to the anode (the ware) and hence ferrous sulphate is formed, which passes into solution; at the cathode, hydrogen would be evolved. A good exhaust system would be essential. When the iron-content limit in the bath had been exceeded, an electrode immune to attack by the sulphate radicle could be substituted as the anode and immersed into the solution, then the current again passed, representing the action thus:—

$$FeSO_4 \rightarrow Fe^{++} + \overline{SO_4}$$

Then at the anode, there is :—

$$2\overline{SO_4} \rightarrow 2SO_4 + SH_2O \rightarrow 2H_2SO_4 + O_2 \uparrow$$

and at the cathode :—

$$Fe^{++} \rightarrow FE \downarrow$$

In words, the ferrous sulphate dissociates into ferrous and sulphate ions. The sulphate ions are attracted to the anode and, being unable to attack the electrode, attack the water in the solution, giving sulphuric acid and evolving oxygen. At the cathode the ferrous ion is deposited and may be removed from the electrode when the iron content has been sufficiently diminished. Iron would also be deposited at the cathode while pickling was in progress due to the electrolysis of the ferrous iron in solution. Theoretically, this method seems quite sound but, of course, like all theories, it must be well tried out experimentally before being adopted in practice.

Drying and First Inspection

After the pickling process, quick drying and covering of the blanks to be enamelled is essential. If processing in ground-coat enamel is to be delayed, a final neutralizer of borax before the drying operation will help to preserve the ware. The borax solution should consist of a solution between 0.03 and 0.045 N. The dryers for the swilled ware can well be heated by waste enamelling furnace gases and, indeed, it is very surprising that this method of heating dryers is not more widely adapted for it shows a very considerable economy. Before passing to the enamelling department, after cleaning, the ware requires very close scrutiny, for faults at this stage are liable to render the finished articles almost beyond redemption. Therefore, experienced personnel, rejecting all except perfect articles, should carry out this inspection. Dents or minor deformations on sheet iron may be removed at this stage by means of a wooden mallet and shaped formers. In order to avoid the formation of rust spots at the metal surface, the work, after swilling, must be dried fairly quickly.

After fusing the ground-coat, the ware must again be closely examined for defects at least by semi-skilled labour, since holes of mere pin-head

* Paper for which the Author was granted the second award in the 1951 Whittle Competition of the Institute of Vitreous Enamellers.

From Pickle Plant to Inspection

dimensions often produce appreciable areas of uncovered enamel in the finished state. Any article bearing cracks, blisters or any similar defects must be rejected and an intelligent decision made as to whether they should be de-enamelled, simply re-fired, or lightly re-sprayed with ground-coat and re-fired. Besides possessing a uniform finish, ground-coat ware should possess also great durability and toughness.

Cover-coat

With regard to the cover-coat enamel, the enamelist's chief objective is to obtain a good " covering power " with as low an application as possible, the thinner the covering, the greater the durability. " Covering power " is linked to the opacity of an enamel and the terms " transparent " and opaque might be considered as defined in elementary physics. A transparent body is one which transmits light in a straight line, whereas a body is opaque when it will not transmit light at all. Actually the terms are only relative as materials usually considered to be transparent, such as glass, do in fact have a transmission coefficient, or more simply, they absorb some of the light which traverses them. Opacity, a diffusion of the light to the enamelist, is attributed to the phenomena of reflection, refraction and diffraction of light by the embedded particles in the glass media. Natural light, which traverses an infinite distance, falls on an object in parallel rays and the diffusion of the light in all directions by means of the aforementioned phenomena destroys the transparency of the enamel. As seen by means of a high-powered microscope, an enamelled surface of considerable area consists of myriads of microscopic bubbles and it is probable that the enamel receives an increment of opacity from this characteristic surface, as these bubbles possibly behave in a manner similar to a glass prism.

Titanium Opacification

The principal opacifying material for cover-coat enamels in modern times is undoubtedly titania, and it is rather puzzling, considering its close proximity to the other opacifiers, tin and zirconium, in the periodic classification of the elements, that it only came to the forefront so recently. No doubt, this was helped by the alarming rate at which the price of tin soared but the main reason for this apparent lapse probably rests with the old-time enamelists, who, with a few notable exceptions, seemed to consider enamelling more of an art than a science, involving many closely-guarded secrets. In recent years, however, the larger enamelling concerns opened wide their gates to progress by installing modern research laboratories and commissioning scientific knowledge to aid them. Thereby, much more extensive fields were successfully exploited.

Titania's advantage over the old enamelists' opacifier, tin-oxide, is not confined merely to the predominating factor of price; it is more refractory and the ratio of the refractive index of titania to that of tin-oxide is given as 2.5:2.04. Therefore, one might conclude that, since opacity is dependent on the amount of refraction and, ultimately, diffusion and related phenomena, all other things such as size and shape being equal, are proportional to the disparity between the refractive indices of the opacifying materials and the medium (then, the titania) should be superior to the other oxide from an enamelist's point of view.

Limitations of Titania

Titania does have its disadvantages, however, such as the near impossibility to obtain a livid-green enamel when using titania as the opacifier, also, in obtaining a red enamel. The enamelist is also confronted with the problem of obtaining a highly-opaque titanium enamel for cast iron. Faults frequently encountered are strain-lining, and subsequent scaling. It might be possible to reduce, if not eliminate, some of these defects by applying a primary coating of a grip-enamel containing a suitable proportion of titanium opacifier, along with appropriate percentages of clay, borax, quartz and water. A grip-coat consisting of these materials finds general application in some enamelling works as a preliminary coat to a titanium-enamel cover-coat. As already stated, titania is also refractory, therefore an increase in fusing temperature would be necessary. A fusing temperature in the region of 840 deg. C. is usually employed for a ball-clay, quartz and water grip-coat, so an increase of 15 to 20 deg. C. might prove most satisfactory. This temperature rise might be more beneficial to further processing, than it would be detrimental to the castings through warpage.

The Author's view is that the temperature rise suggested would bring about more uniformity of structure in the castings and thus reduce such defects as " boil " which are common to cast-iron enamelled ware. Also, it is understood that titania and iron combine to form a compound, stable at 900 deg. C. The higher temperature then may promote this combination at the metal surface and increased adherence of the cover-coat enamels may result.

If the employment of the opacifier, in conjunction with the other materials mentioned, is not successful, then, as an alternative, the titania could be ground with a suitable flocculating agent only, in proportions determined by experiment. A very light coat of it could then be applied to the castings, dried, and fused at a temperature found to give the most satisfactory results. Where greater opacity is required in an enamel, whether for sheet iron or cast iron, it can be recommended to attempt to blend the original frit with another of higher opacity. Although this will require a re-matching for colour, it is often successful and well worth while.

Reversion to Cast-iron Ware

With the tremendous demand for sheet-iron ware a few years ago, cast-iron enamels have been somewhat neglected in favour of developing outstanding enamels for sheet. With the trend gradually reverting to more of cast-iron components to promote greater serviceability in appliances, one is tempted

to ask if this former development has been made complementary. The customer certainly seems delighted with the modern cast appliances, and that may be accepted as the answer. However, due to the apparent slower development of enamels for cast iron as compared to sheet iron, one is often confronted with the problem of having a super-opaque white of the latter group much too white and " clean " when compared with its cast-iron counterpart. This can be readily overcome by adding to sheet-iron enamels a solution containing an adequate amount of manganese acetate. This has the effect of promoting a dirtier appearance, but also gives a brownish tint to the enamel. Almost as effective as manganese acetate, is a solution consisting of disodium phosphate and sodium nitrite. As a precaution against either over-setting or de-setting the enamel, they are incorporated in their respective chemical equivalents; there is also the advantage then of not promoting the brownish tint.

New Method of Mottling

Recent progress shows that the enamelling industry was not over-long in appreciating customers' tastes. Proof of this is the rapid decline in sponge mottling, the demand being for the brighter, contrasting and attractive finish of the modern vitreous-enamelled components. Sponge mottling, however, could be employed to give this effectiveness, the method being to use strong solutions of a variety of chemical compounds dissolved in methyl alcohol. The procedure is similar to that usually adapted for sponge mottling except the solution is put on with a sponge instead of the component being coated all over and the surplus being removed. The feature of this method of mottling is the elimination of the drabness which accompanies the " standing-out " or wrinkle appearance of the mottle.

A very attractive finish was obtained by the Author and a colleague by dissolving in industrial spirit a calculated amount of potassium bichromate and cobalt carbonate (the nitrate of the latter may be used, but, because of the lower acidity of the gas evolved, the carbonate is preferred). A casting was processed in a cream base-coat and, after fusing, the solution applied with a sponge. It was then fused at a temperature in accordance with that stipulated for the base-coat. The resulting colour effect was a blue/green mottle in contrast to the cream base, the whole being completely fired down.

Using this method, however, it is exceedingly important that a definite temperature/time cycle be rigidly adhered to for consistency of colour of the mottle, since the amount of decomposition (which is the governing factor with regard to the colour consistency) varies directly as the temperature, until the stage is reached where total decomposition is obtained—this is a higher temperature than that usually met with in an enamelling shop. The calculations for amounts of the substances are based on the yield of the oxides, and the action may be represented thus:—

$$2K_2Cr_2O_7 \rightarrow 2K_2O + 2Cr_2O_3 + 3O_2.$$

If sufficient heat is applied however: $2K_2O + 4CrO_3$ are the products of the combustion. The sesquioxide is a green powder and is the oxide formed at temperatures greater than 250 deg. C.

As may be reasoned by the phase rule :—

$$\frac{2(K_2O)^2(Cr_2O_3)^2(O_2)^3}{(K_2Cr_2O_7)^2} = K$$

where K is a constant when the temperature is constant.

Also, if one applies the rule for determining the degrees of freedom, *i.e.*, P + F = C + 2, where P is the number of phases, F the degrees of freedom and C the number of components present, 4 + F = 3 + 2, therefore F = 1. The degree of freedom is then the temperature.

This mottling method may require too much perseverance and attention in a large establishment but may be readily adapted by the smaller works such as those which concentrate on high-lustre finishes of the ferric-chloride type. This finish, whilst not revolutionary, is definitely intriguing and of great interest. A variety of lustre finishes could undoubtedly be obtained, given the necessary facilities, by experimenting with solutions of various metal chlorides either singly or mixtures of them.

Sieving

To maintain colour consistency with all enamels, a colour trial should be processed under production conditions. If the trial is taken before the enamel batch is tapped out, then considerable time and labour are saved in making the adjustments at the mill. When tapping, the batch should be well sieved and it should be brought to the correct consistency before despatching to the spray shop. It sometimes occurs that, when an enamel has been stored in a very warm atmosphere, such as that usually experienced in a spray shop, it coagulates and it is necessary to re-sieve it. This invariably results in a considerable loss of production time. Observing this, the writer conceived the idea of developing a plunger type of sieve for use in such circumstances. It is simple in construction, consisting of two metal hoops joined by vertical metal rods and having the bottom and outside covered with a gauze of suitable mesh. It is not envisaged that this device could possibly supersede the electrically-operated vibratory sieve commonly used, for the latter has three distinct advantages, namely, vibration; the force of gravity and surface tension which is immaterial (not so important to the vibrator type having the influence of gravity). There is also the fact that an enamel, although a fluid, is not a true solution. It is a suspension. Nevertheless, with " slips " of suitable fineness and specific gravity, it might prove a time-saver when such circumstances as those mentioned arise and, if found successful, could be adapted for quick sieving sheet-iron ground-coat settlings.

Faulty sieving causes additional costs and it remains for the sprayer/operator to report on such a matter immediately. The enamel finish is frequently impaired by the failure of operators to comply with this requirement, and also lack of agitation. Most enamelists realize that periodic

(*continued on page* 482)

Obituary

MR. WILLIAM HENRY SILVESTER, chairman of W. H. Silvester, Limited, manufacturers of engineers' and smiths' hammers, of Sheffield, died recently.

PROF. SIR CHARLES INGLIS, vice-provost of King's College, Cambridge, from 1943 to 1946, and Professor Emeritus of Engineering in the University of Cambridge, died on April 19 at the age of 76.

MR. G. E. EAGLESFIELD, formerly managing director of Pattinson Bros., Limited, ironfounders, etc., of Sheffield, died recently. He retired from active work with the Company in 1946, but retained a seat on the board.

THE DEATH is announced of MR. J. A. CRAVEN, the secretary of the Planet Foundry Company. This occurred last Thursday. Mr. Craven, who was 57 yrs. of age, had been at business during the day but collapsed shortly after his arrival home. He had been with the Company for over 30 years and became secretary in 1933.

THE DEATH occurred recently, at the age of 76, of MR. JOSEPH SIMPSON, a past chairman of Horsehay Company, Limited, ironfounders, of Wellington (Salop). He received his early training at Tangye's Limited, Smethwick, and joined the Horsehay Company about 1898, retiring in 1949.

THE DEATH occurred on April 18 of MISS HILDA MARTINDALE, one of the first women members of the Civil Service, which she joined in 1901. In 1925 she was appointed Deputy Chief Inspector of Factories, eight years later becoming Director of Women Establishments at the Treasury. Miss Martindale retired in 1937.

MR. R. H. BRACKENBURY died suddenly at his home, Abinger Common, Surrey, on April 22. Mr. Brackenbury was joint managing director of Sterling Foundry Specialties, Limited, from the inception of the Company in 1920 until his death. He was a member of the council of the Foundry Trades Equipment and Supplies' Association for many years, and held the office of president of that Association for two years. His charming personality and wise counsel will be sorely missed by his colleagues in the Association.

Foundry Appeal Dismissed

The appeal by Walkerdine Brothers, of Walsall, against the refusal of Lichfield Rural District Council, acting on behalf of Staffordshire County Council (as local planning authority), to permit the erection of a non-ferrous foundry on land near Gladstone House, Castle Street, Brownhills, has been dismissed by the Minister of Housing & Local Government. At the local enquiry on March 20, when the appeal was heard by Mr. D. Senior, a Government inspector, it was stated that permission was refused on the grounds that the site is a residential area where the proposed development would be inappropriate and injurious to the amenities and that suitable alternative sites were available within a reasonable distance.

Grounds of appeal were that the site was quite unsuitable for houses; there would be no injury to the amenities of the area; that the land was owned by the appellants, who did not desire to move elsewhere, and the decision of the planning authority was harsh and unreasonable.

ANTIMONY ORE, basis 60 per cent., is now quoted at 37s. 6d. to 40s. nominal per unit c.i.f., against 40s. to 42s. 6d. nominal previously.

Recent Wills

MACKIE, C. J. T., assistant secretary of the Institution of Chemical Engineers £7,771

HIND, H. E., formerly chairman and managing director of Triplex Foundry, Limited, Tipton (Staffs) £21,565

STEAD, J. A., formerly a representative of James Booth & Company, Limited, non-ferrous metal manufacturers, etc., of Birmingham £8,486

ROSS, JOHN, formerly secretary of the Neptune shipyard of Swan, Hunter & Wigham Richardson, Limited, Wallsend (Northumberland) £7,202

RINGROSE, THOMAS, a former director of E. E. Jeavons & Company, Limited, manufacturing gas engineers, of Tipton (Staffs), and of Henry Hope & Sons, Limited, metal window manufacturers, etc., of Smethwick £42,547

KNAPP, L. F., general works manager with Imperial Chemical Industries, Limited, at Wilton, formerly general manager of Imperial Chemical Industries at Heysham, and manager of the company's oil division at Billingham £26,848

DUGDALE, F. W., late managing director of S. P. Austin & Son, Limited, shipbuilders, of Sunderland, a former president of the Shipbuilding Employers' Federation, late chairman of the Wear Shipbuilders' Association, a member of Lloyd's Register Technical Committee, and of the board of the River Wear Commission £12,022

AYRE, SIR AMOS LOWREY, formerly chairman of the Shipbuilding Conference, and of the Burntisland Shipbuilding Company, Limited, president of the Institute of Marine Engineers 1946-48, a vice-president of the Institution of Naval Architects, and a Fellow of the North East Coast Institution of Engineers and Shipbuilders, Prime Warden of the Worshipful Company of Shipwrights 1946-47 ... £33,593

INTESTATE

REAH, WILLIAM, a former cashier of Swan, Hunter & Wigham Richardson, Limited, shipbuilders, of Wallsend (Northumberland) £1,382

U.S. Steel Corporation Record

Production, sales, deliveries, rates of operation, and movement of iron ore from mines to furnaces by the United States Steel Corporation during the year 1951 were all greater than in any previous year of the Corporation's history. This information is given in the annual report presented by Mr. Irving S. Olds, chairman, at the recent annual meeting in New York. The chairman said that throughout the year the prices of steel products were not fixed by competitive forces, but rather were under arbitrary Government control. As a result, the general level of steel prices had not been raised to cover increases in costs since the last general advance in steel prices on December 1, 1950.

Income for the year 1951, therefore, despite record-breaking production and sales, fell far short of approaching a new high figure, the Corporation's profit margin of 5.2 per cent. of sales being at the lowest level experienced in any year of high operations when the country was not engaged in all-out war. In 1950 this percentage of sales was 7.3.

Mr. Olds said that on January 1, 1952, the Corporation's annual ingot capacity was 34,600,000 net tons (2,000 lb.), being an increase of 2,600,000 tons, or 8.1 per cent. over its ingot capacity at the outbreak of hostilities in Korea in June, 1950. It was an increase of 5,800,000 tons, or 20.1 per cent., over capacity at January 1, 1946. Operating rate was over 101 per cent. Under construction were additional facilities which when put to work would further increase steel capacity, so as to result in an overall increase since the outbreak of hostilities in Korea of 4,900,000 tons, or 15.3 per cent.

BARBER-COLMAN COMPANY of Rockford, Ill., U.S.A., are acquiring Wheelco Instruments Company as from May 1, 1952.

Economic Prospects, 1952

Greater Production Needed from the Metal Industries

To offset the disastrous change which took place in 1951 in the overseas balance of payments of the United Kingdom, the Government's "Economic Survey for 1952" states that, in addition to the import cuts already imposed, earnings from exports to non-sterling countries must be increased rapidly. This cannot be done, it is pointed out, without a large expansion in the volume of engineering exports. The really important thing is to increase the output of the engineering industries and of the basic industries, especially coal and iron and steel.

The defence programme launched in January, 1951, provided for a total expenditure (at the prices then ruling) of some £4,700,000,000 over the three years beginning in April, 1951. This sum included the cost of civil defence, but excluded stockpiling. Nearly 60 per cent. of the total was attributable to production of arms, equipment, and clothing, to works and buildings, and to research and development. The intention behind the programme was that the country should rearm as quickly as was consistent with the maintenance of a strong and healthy economy, and it was considered vital that our capacity to export should not be seriously impaired.

By the end of 1951 good progress had been made with the placing of the necessary contracts, and about £1,320,000,000 of the £2,000,000,000 for production in the original three-year programme had been translated into actual orders. Production had not, however, proceeded as fast as had been hoped, and it was already clear that the original programme could not be completed within the three years.

Production Prospects in 1952

In considering the prospects for production in 1952 it cannot be assumed that there will continue to be a demand for the largest increase in output which every industry is capable of achieving, as there has been, with few exceptions, since the war. In the case of coal, iron and steel the greatest possible increases in production are urgently needed. In engineering, too, there is a large and pressing demand still unsatisfied both at home and overseas. The main obstacles to meeting this demand are the shortage of steel, which is aggravated by uneven distribution of stocks, and the shortage of the right kinds of capacity in the engineering industries.

So long as steel remains scarce, the Government intends to use the allocation system to concentrate production on the kind of goods most needed in the interests of the balance of payments and rearmament, at the expense of civil investment and consumption at home. This will mean that production of some types of metal goods will have to be cut down. Production and employment in many of the consumer goods industries must depend on the ability of these industries to expand exports.

Prospects for imported raw materials are still partly governed by actual scarcity, though less so than last year. On the other hand the United Kingdom will not be able to pay for all the materials it would like to buy.

Supplies of copper and sulphur (together with pyrites) will probably continue to be limited by physical availability, and it will be necessary to retain some restrictions on civil use. The United Kingdom should, however, be able to get rather more copper this year than last. Provided that the means can be found to pay for them, other raw materials should be available in sufficient quantities to match the available supplies of steel or, where steel is not a limiting factor, to provide for the probable level of demand for finished goods.

There are, however, a number of uncertain factors which may alter this prospect. In particular, the scarcity of non-ferrous metals is at present partly masked by the steel shortage, and demand for some of these metals may tend to increase if steel becomes more plentiful.

Above all, however, the maintenance of supplies of raw materials depends upon our ability to buy them, and this underlines the importance of the measures being taken to increase our overseas earnings.

In 1951, for the first time since the war, the production of steel was less than in the previous year. There was sufficient capacity in the blast furnaces and steel furnaces for the production of some 10,250,000 tons of pig-iron and ferro-alloys and 16,750,000 ingot tons of steel. In fact only 9,670,000 tons of pig-iron and 15,640,000 tons of steel were produced because of shortages of raw materials—particularly scrap, iron ore, and coke. The consumption of scrap in steelmaking fell by over 1,100,000 tons compared with 1950. This was largely due to a fall in scrap imports, which come mostly from Germany, from 1,930,000 tons in 1950 to 560,000 tons in 1951; at home the scrap drive brought out 324,000 tons from the steel industry itself in addition to the normal arisings, but other home supplies of scrap declined.

Shipping Problems

Shipping difficulties, which were aggravated by imports of coal from the United States, led to a shortage of rich imported ore in the early part of the year, and this, combined with a shortage of hard coke in the second half of the year, continued to keep down home production of pig-iron, which was only 36,000 tons higher than in 1950.

Imports of steel were maintained with difficulty at about the 1950 level. Direct exports of steel were reduced by over 600,000 ingot tons, and as a result of this and of increased drawings on producers' stocks the amount of finished steel delivered to the home market was increased from 14,200,000 tons (in ingot equivalent) in 1950 to 14,550,000 tons in 1951.

On February 4, 1952, an allocation scheme for general and alloy steels came into force. This is a revival of the earlier scheme, which was started during the war and discontinued in 1950 when supplies became more plentiful, though a similar scheme remained in operation for tinplate and sheet steel. The likely supplies for each quarter are allocated in advance to sponsoring departments, which in turn distribute the steel between the consumers for which they are responsible.

Scrap Supplies

Since the new scrap supplies are unlikely to be greater than in 1951, and since there can be no further drawing down of stocks of pig-iron and scrap, crude steel output in 1952 can equal or better the 1951 output only if there is a very substantial increase in the production of pig-iron for steelmaking, which depends in turn on a substantial increase in iron-ore and coke supplies. There is a good prospect that the necessary supplies of rich foreign ore will be obtained.

Economic Prospects, 1952

Blast furnace and coking capacity will increase during the year, but lack of hard coke may continue to limit pig-iron production. Another uncertainty is the share of supplies of pig-iron and scrap which the iron foundries will receive. The output of crude steel in the first three months of this year has been below that in the corresponding period last year (when stocks of pig-iron and scrap were drawn on heavily), but it is hoped that a progressive improvement throughout the year will raise production above the 1951 level in the later part of 1952.

Imports of steel are expected to be over 1,000,000 tons higher (in ingot equivalent) than last year. This will be largely due to the increased supplies which the United States is making available under the agreement for the exchange of raw materials made by the Prime Minister last January. The full benefit of the extra American steel will not, however, be obtained until the later part of the year. It is hoped to maintain exports at the 1951 level. If this is done, there should be an improvement in supplies to home industry, but with the increased demands for rearmament and export production a shortage of steel is likely to persist.

Metal-using Industries

The metal-using industries employ more than two-fifths of all workers in manufacturing industry. They contribute about one-seventh of the gross national product and two-fifths of the nation's exports. The gross value of their output last year is estimated at about £3,350,000,000, compared with £2,850,000,000 in 1950. During the last two years almost one-third of this output has been exported, and about one-half has been used to provide the industries of this country with new capital equipment and with the spares, accessories, and stores needed to keep existing equipment in repair. Defence took nearly one-twelfth of total supplies of metal products in 1951. Most of the remainder was accounted for by consumer goods.

There was a further considerable increase in the output of the metal-using industries in 1951 in spite of the shortage of steel, which became progressively worse as the year advanced: in some cases production was also held up by lack of non-ferrous metals. The main expansion during 1951 was in output of military equipment, and in some important sections of the metal-using industries production declined. The outstanding example was the motor industry where output, including military vehicles, was 6 per cent. less than in 1950.

No satisfactory solution can be found for the balance of payments problem without a further substantial increase in the exports of the metal-using industries. This consideration has compelled the Government to limit defence claims on these industries and to restrict supplies of metal goods for civil investment and consumption at home.

Changes in Pattern of Output

The cuts in investment and consumption of metal products are likely in time to involve significant changes in the pattern of the output of the metal-using industries, but the extent and nature of the changes required must depend upon overseas demand for engineering goods. The main objective in keeping these goods off the home market is to expand exports as quickly as possible, and allocations of steel to the industries concerned will be determined largely with this objective in view.

Where the goods cannot be sold abroad, production will have to be curtailed, so that men and materials can be released for transfer to defence and export work elsewhere in the metal-using industries. Switches of

(*continued at the foot of col.* 2)

this kind must inevitably entail some temporary loss of output, but this is a price that has to be paid in order to secure the longer-term development of exports.

It is hoped that there will be sufficient steel in 1952 to permit the metal-using industries as a whole to continue to expand their output. Production of some types of engineering goods may, however, be expected to decline for the reasons given earlier.

Parliamentary

Steel from America

Asked by MR. GERALD NABARRO what quantities of steel had been received against the American purchase of 1,000,000 tons, and what was the anticipated date of completion of shipments, MR. SANDYS, Minister of Supply, said that at the end of the first quarter of this year, about 172,000 long tons of steel, pig-iron, and scrap for Britain had been delivered at works in the United States or at other sources of supply. Of this 85,000 tons had reached the United Kingdom. It was expected that deliveries at the source of supply would be completed by the end of 1952 in accordance with the agreement.

MR. GEORGE CHETWYND asked if, in view of the uncertainty that existed in the American steel industry and the effect that this might have on deliveries of steel to this country, the Minister would reopen negotiations with the U.S. authorities to allow us to purchase ore and scrap direct from Germany and Sweden instead of indirectly through the U.S.A.

MR. SANDYS: "That really is the position. So far as we are getting additional ore, for example, from these countries as a result of this agreement we are receiving it direct and not getting it through the United States. What is happening is that the United States buyers are holding off, and so making more ore available in those countries for purchase by us."

When MR. R. BROOMAN-WHITE asked if the Supply Minister would continue to impress on the Americans the great difficulties of our steel industry at the present time and the benefits of any steps to mitigate those difficulties, such as, in particular, the Americans continuing to make available to us the supplies of raw materials due to them under previous agreements with other European countries, MR. SANDYS said that he thought the U.S.A. was very well aware of our needs and had gone a long way to help us in the way suggested. "Steel from any quarter is very acceptable," he replied when asked by MR. SYDNEY SILVERMAN if he was aware that one of the most interesting transactions recently completed at Moscow was the sale for immediate delivery by the Soviet Union to Pakistan of 100,000 tons of steel, and if he would consider whether this might reveal a possible alternative source of supply.

U.S. Steel Prices Raised

An increase in steel prices of nearly $3 per ton was approved by the United States Government on April 23. The increase is one-quarter of what the managements said they needed to cover wage increase demands.

It is expected that Mr. Roger L. Putnam, the economic stabilizer, will make recommendations concerning the amount of the wage increase the Government will impose during next week. Mr. Truman ordered seizure of the industry on April 8 when the managements and the union failed to reach agreement on the amount of a wage increase and other benefits recommended by the Wage Stabilization Board.

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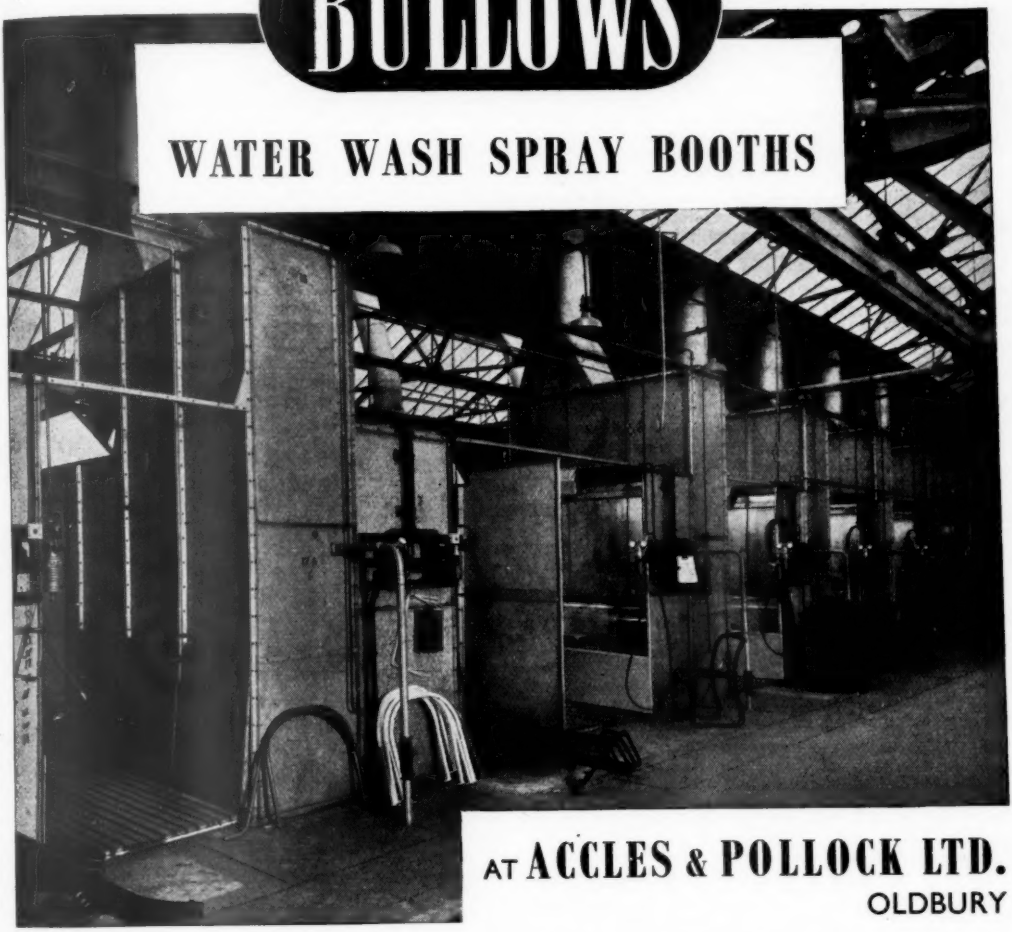

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News in Brief

THIRTY-TWO MEMBERS of the Crossley Premier works, Sandiacre, paid a visit to Stewarts & Lloyds Limited, steel foundry at Wolverhampton.

MORE THAN 150 members and their friends recently attended a concert organized by the Bryan Donkin and British Furnaces Sports and Social Club.

THE FOUNDRY DEPARTMENT of the Gearless Stokers (Manufacturers) Limited, West Gainslead, Horsham, Sussex, which makes machine-tool castings, is in future to be known as the Bison Foundry.

WORK will start soon on the construction of a light machine shop, offices and apprentices' training school for C. A. Parsons & Company, Limited, engineers and electrical plant manufacturers, etc., of Newcastle-upon-Tyne.

NEARLY 1,000 TENANTS of Birmingham houses scheduled for improvement have accepted the city council's offer to fit modern solid-fuel appliances approved by the Coal Utilisation Council in return for rent increases ranging from 3d. to 6d. a week.

WHEN THE TULLOS FACTORY at Aberdeen is opened as a branch of the Consolidated Pneumatic Tool Company, Limited, of Fraserburgh, there will be work for 1,100 engineers and 400 women. The factory opens to-day, and within 15 to 18 months it will be in full production.

THE SIXTH CONGRESS of the International Scientific Film Association will take place from September 23 until October 1, 1952, in Paris. All enquiries about this should be addressed to Stanley W. Bowler, Hon. Press Officer, Scientific Film Association, 164, Shaftesbury Avenue, London, W.C.2.

THE PRESENTATION of gold watches to past and present employees of Jowett Cars, Limited, Bradford, who have completed 25 or more years' service with the firm, was made by Mr. H. Woodhead, chairman and joint managing director of the company, to some 97 members of the firm on April 21.

BELIEVED to be the first company in the Midlands to run a course of this type, Richard Thomas & Baldwins, Limited, is conducting a civil defence course at its Brierley Hill (Staffs) works for 10 men and four women students drawn from the Brierley Hill, Stourport, Kingswinford, and Kidderminster works of the company.

MR. R. G. DUCKETT, technical sales manager of Foundry Services Limited, Birmingham, left by air from London on April 29 to attend the International Foundry Congress at Atlantic City from May 1 to May 7. Following this, a period of approximately four weeks will be spent with the technical personnel of Foundry Services (Canada) Limited visiting a number of foundries in various parts of Canada.

CURRENT NEWS about the German battleship Tirpitz, from Norway is that she lies almost submerged near Tromso, and in salvaging operations has so far yielded 15,000 tons of steel plate and scrap iron. Two cranes, with a lifting capacity of 200 tons, are being used. The battleship's thick armour plating is cut into pieces weighing about 10 tons and it is hoped to raise altogether about 40,000 tons of ferrous metal.

THE BRITISH INSTITUTE OF MANAGEMENT has published, under the title of "Stock Control and Storekeeping," a revised edition of part 5 of the B.S. 1100 series, to which has been added much new material, and a bibliography of books and articles on more specialized aspects of the subject. The book is illustrated with 12 charts and two appendices and is obtainable, price 5s. post free, from the Institute at Management House, 8, Hill Street, London, W.1.

THE INDUSTRIAL MIDLANDS being urgently concerned with the supply of scrap metal, some boroughs are seeking the aid of their Parliamentary representatives to press the importance of the matter in the House. Mr. G. Nabarro, M.P. for Kidderminster, has tabled a question to the Ministry of Supply demanding "what steps the Minister is taking to survey and collect scrap iron and steel from closed-down and disused railway branch-lines, particularly rails not capable of re-use as such."

A COMPANY specializing in the manufacture of switchgear has now been established by the Lancashire Dynamo organization to give full effect to the increased production of an extended range of heavy industrial fuse switches and switchboards. The new company will be known as Lancashire Dynamo Switchgear, Limited, and production has already been established at Bridgwater, Somerset. This development follows the transfer of the manufacture of heavy industrial switchgear and switchboards from the Wimbledon works of Foster Transformers & Switchgear, Limited (another Lancashire Dynamo Company) to Bridgwater in June of last year.

SO SUCCESSFUL was the course in safety held for power press operators and toolsetters at Birmingham University last year, that a further course is to be organized for two weeks beginning July 7 this year. The course will be organized by the Midland Advisory Panel on Accidents and H.M. Inspectorate of Factories, in conjunction with the Birmingham and District Industrial Safety Group. There will be an opportunity for those who attended last year, and several representatives from local foundries were among them, to take a "refresher" course this summer, when it is proposed that discussions should be arranged on the reaction to operating methods in the workshop's since last year's gathering.

THIRTY EMPLOYEES at the Incandescent Heat Company, Limited, Smethwick, worked through the Easter holidays to complete an important contract for the Canadian Car & Foundry Company, Limited, Montreal, the largest firm of its kind in the Commonwealth of Canada. The contract, which had been secured against American competition, was for a high-temperature mechanical furnace, capable of dealing with 10 to 15 tons of material an hour, with a continuous-flow balanced hearth walking beam and charging and discharging machinery. Time was a key factor in the contract because it had been specified that shipment should be made on the first available British boat entering the St. Lawrence this spring. Six lorry loads of machinery drove off to Liverpool from Smethwick right on time.

TO FACILITATE the loading and unloading of railway goods wagons directly from and to road vehicles by power pallet trucks, Lansing Bagnall, Limited, of Basingstoke, have developed a new addition—a mobile loading platform—to their range of materials-handling equipment. This consists of a four-wheel trailer with two platforms of adjustable height, hinged at an intermediate point, which can be raised or lowered by means of a convenient crank-handle which operates mechanical screw jacks and a linkage system. At the rail wagon end, the platform remains in a horizontal position at all times and has a vertical movement of 3 ft. 9½ in. to 5 ft. 3½ in. above ground level, with an area of 6 ft. by 6 ft. The road-vehicle end has a vertical movement of 3 ft. 1 in. to 4 ft. and forms a sloping platform 10 ft. by 6 ft. which allows it to be used as a ramp.

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Raw Material Markets

Iron and Steel

There is little change in the raw materials position, the primary need being for increased pig-iron production. Supplies of scrap available for the steelworks are barely sufficient to provide for the melting furnaces now in operation, and on present deliveries there is little prospect of re-starting the furnaces which were forced to close down for lack of raw materials. The blast furnaces now operating are insufficient to meet the needs of the steelmakers as well as those of the foundries.

Several blast furnaces are now ready for blowing in and more are due to come into operation shortly if sufficient supplies of coke can be obtained. The amount of coke being delivered is just about sufficient for the furnaces now in blast, but stocks are not being built up to provide adequate quantities for fresh units.

Supplies of pig-iron for the foundries are very stringent. Many foundries, particularly engineering and speciality foundries, are working hand to mouth. Hematite is very tight.

Every effort is made to make good the shortage of low- and medium-phosphorus irons with alternative grades, but with little success. The light and jobbing foundries appear to be well provided with work. It is expected that a furnace in the Derbyshire area will be changed over to the production of foundry pig-iron very shortly, and if this materializes some additional relief in supplies may be hoped for.

Ganister, limestone, and firebricks are coming forward satisfactorily and those foundries requiring ferro-alloys are generally able to satisfy their needs.

The re-rollers continue to be very short of semi-manufactured steel. Until there is increased production at home steelworks there is little prospect of additional supplies of semis for the re-rollers and allocations are much below requirements. Some consignments from the Continent and Japan have been received, and these have given some relief but much more could be used.

Non-ferrous Metals

South America has been a good deal in the news so far as non-ferrous metals are concerned during the past week or two. In Chile there has been for some time a threat of strike action at two large copper properties due to a dispute about wages, and as zero hour approached it looked very much as if the trouble would break out. The last news to hand is that at one of the mines a strike has begun, but it is to be hoped that continuity of operations at the other mines will be preserved.

Already the overall situation in the Chilean copper industry is causing some misgivings, to the extent that a prolonged argument is taking place between the mines and the U.S. Gvoernment on the question of the price that is to be paid for exports to the States during the ensuing 12 months. The Chilean Government, which has hitherto retained 20 per cent. of the tonnage produced for sale on the world market at the best price obtainable, has now realized that the halcyon days of ultra-high prices are over, and is in consequence anxious to sell all the copper to the U.S.A. An additional six cents per lb. has been demanded. Washington has demurred and the matter is now under discussion.

It is almost certain that the Chileans will succeed in their endeavour to secure something extra, for America really cannot manage without help from oversea. But whether the f.a.s. New York price will be raised by the amount of the concession made by the Americans has yet to be seen. There is some suggestion now that the U.S. Government might decide to subsidize the importation and leave the level at 27½ cents.

The other event that has created some stir is the threat by the Bolivian Government, newly constituted following the revolution, to nationalize the tin mines in that country. The contract with the R.F.C. has yet to be arranged, and it looks as if the Bolivians will have to reconsider their original ideas about price. To expect $1.50 is hopeless, for the U.S.A. is now more comfortably placed than before in regard to supplies.

In the meanwhile, concentrates are said to be piling up at the Bolivian ports, and sooner or later something will have to be done about it. Obviously Bolivia must export tin, which means so much to the economy of the country.

London Metal Exchange official quotation were as follow:—

Cash—Thursday, £965 to £965 10s.; Friday, £966 10s. to £966 15s.; Monday, £965 to £965 10s.; Tuesday, £964 10s. to £965; Wednesday, £964 to £965.

Three Months—Thursday, £966 10s. to £967; Friday, £967 10s. to £967 15s.; Monday, £966 10s. to £967; Tuesday, £966 10s. to £967; Wednesday, £964 10s. to £965.

From Pickle Plant to Inspection

(*Continued from page* 475)

agitation is essential for successful processing, but there still remains a section of operators who fail to grasp its importance. This is exemplified by a very recent incident involving the Author, who was instructed to give undivided attention to a non-too-regularly-used enamel which was giving rise to a considerable amount of difficulty because of "dulling." Previous attempts had been made to overcome this defect and, strangely enough, it was corrected after each investigation but the underlying cause was not detected, and hence reappeared repeatedly. The reasons for the enamel's behaviour included, among others, "poor" frit batches, "under-firing," and "dry-spray."

A slop sample was obtained from the mill-room storage receptacle after a thorough agitation. The resulting trials, representing about fifty production components, showed such an astounding improvement that it was alleged that they had been glazed. (An operation which had been previously resorted to with moderate success to reclaim those components already processed so as to avoid re-enamelling and re-processing.) The advocators of "poor" frit were somewhat taken aback when informed of the root of their trouble, which was, of course, lack of agitation. Most experiences yield a moral and here it seems to suggest, "apply first principles."

The inspection of the finished ware should be performed under constant conditions of light. These conditions should also apply to the checking of the mill colour-trials. By granting junior technicians more scope and access to the works or recognized authorities to learn of the refinements of vitreous enamelling, some improvements might possibly be brought about. Perseverance with an idea may involve a slight dislocation of production, hence a well-equipped laboratory is essential.